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A model of the inquiry process based on John Dewey's concept of inquiry was used to develop a means of observing and scoring individual inquiry behavior. The Teacher's Inbasket, a simulation of problems crossing a teacher's desk in a simulated school setting, was developed for the study. Fifty-one female elementary education majors were selected as subjects on the basis of the patterns of psychological and academic achievement characteristics they manifested. Subjects were divided into four groups according to cognitive style configuration and college grade point average (GPA). Their behavior was observed, and they were trained to "think aloud" while completing inbasket forms, one before student teaching and one after. Correlational and multiple regression analyses revealed that "through using a combination of predictor variables characterizing different personality-cognitive style types, significant predictions can be made of the inquiry bahavior of teachers-in-training as subjects." College GPA generally proved irrelevant as a predictor. (Also reported are content analysis descriptions of the inquiry process in relation to the philosophical concept of "dialectic," effects of student teaching experience on inquiry performance, and relations of inquiry performance to conceptual tempo. Appended are a 51-item bibliography, inbasket materials, scoring information, selected tests and scales, supplementary matrices and tables, and raw data.) (SG)

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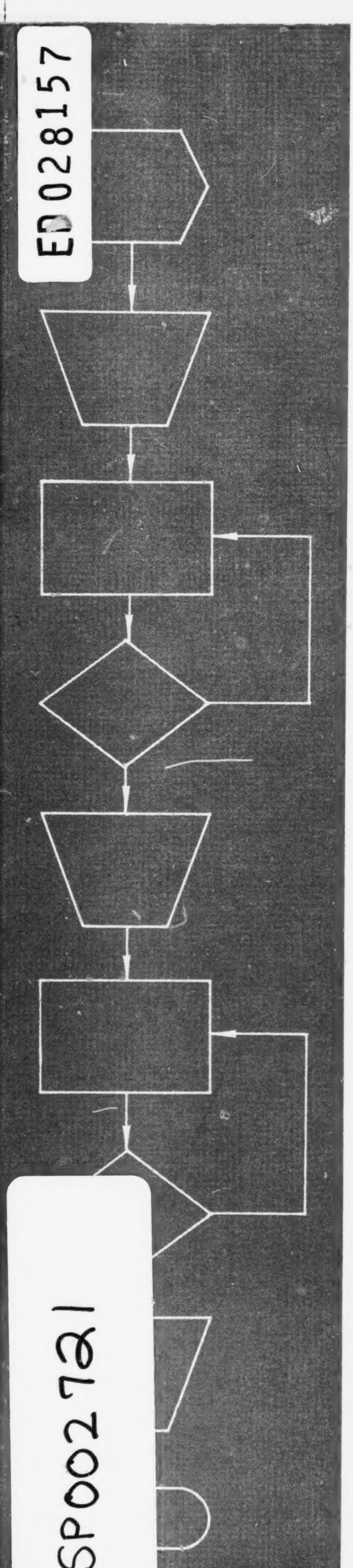

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STUDIES OF THE
INQUIRY PROCESS

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FINAL REPORT
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STUDIES OF THE INQUIRY PROCESS

Inquiry Patterns of Students In Teacher-Training Programs

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East Lansing, Michigan

July, 1968

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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PREFACE

This volume reports a series of studies of individual inquiry behavior. It represents, however, the joint efforts of many individuals. Some participated directly in the research itself. Others participated via their long-term influence on the inquiry behavior of the principal investigator.

My concern for inquiry was originally stimulated by the study of philosophy with Harold Dunkel and Joseph Schwab. Benjamin Bloom, Frederick Lighthall, Herbert Thelen and Philip Jackson were among the faculty members who taught me how behavioral science research could cope with the study of human cognition. For all these men inquiry was more than an object of study--it was a way of life. As fellow graduate students and close friends, Jerome Allender and Arthur Elstein assisted in developing many of the ideas which have enriched this research.

A number of Michigan State University graduate students served as research assistants in this project. Their creativity in helping develop new material, their patience and perseverance over the long hours of observing and analyzing inquiry performance and their continued enthusiasm as the research moved along contributed inestimably to the project's successful completion. This group of worthy collaborators included Joan Lynas Hamachek, Joyce Bredahl Wong, Bettie Farace, Merlyn Mondol, E. Larry Eberlein, Miles Simpson, Mary Braseth and Laura Lichleiter Morlock. Though the project can surely not take all the credit, it should be noted that three of the young ladies pursued both truth and husbands simultaneously during the period of this research, and succeeded in capturing both.

My colleagues at Michigan State University have been a constant source of ideas and insights. I would especially acknowledge the assistance of David Krathwohl, Joe Byers, Robert Craig and Hilliard Jason.

Appreciation should also be expressed to John Ivey and John Jamrich, Dean and Associate Dean of the MSU College of Education, for their continued support throughout the period of this research.

A project this large is run as much by the project secretary as by the principal investigator. Joyce Stewart, Barbara Savery and Julie Askew ably served in that capacity over the project's course. The responsibility for typing the final manuscript was carried by Julie Askew, Joyce Stewart and Lynda Crafton.

My two collaborators in the writing of this report, Michael Loupe and Richard Piper, merit special mention. Both began work on this project as research assistants. In the course of our work together they have become valued colleagues and friends. Their insights and contributions permeate the body of this report.

Judith Shulman has contributed to this research since it first was conceived early in 1962. She helped in shaping the original conceptions, developing the materials, pilot testing the techniques and conducting the first study which used the Teacher's In-Basket. In the present study she has participated in data collection, protocol analysis and critical reading of the final manuscript. Her encouragement in times of stress and assistance in times of need will never be forgotten.

Finally we must thank the hundreds of teachers and students in teacher-training programs who participated in this study. They devoted many hours of their time for little compensation in order to assist in this project. If educational research is to have growing relevance to the practice of education, it will be due to the continuing cooperation of such dedicated professionals.

L. S. S.
June, 1968
East Lansing

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CHAPTER I

OVERVIEW AND SUMMARY

Janus was a relatively minor god in the Roman pantheon. His most striking characteristic, a visage capable of looking forward and back simultaneously, made him the obvious choice for god of doorways--not the most distinguished role for a deity. Yet, his unique physiognomy makes him particularly relevant to the task of the present chapter. This overview and summary, like Janus, must look both forward and back. For the reader it is a preview of things to come. For the authors it is a review of research completed. The first section to be read, it was the last to be written.

The priests of Janus saw to it that this god of modest, though multiple, endowment received several special recognitions. His was the first name mentioned in prayers; his priest held first rank in the pontifical assembly. The first month of the calendar carried his name. He became, not merely the god of doorways, but of all beginnings.

Janus has yet another meaning for us as we prepare to describe our research on the inquiry process. He serves as a reminder of the special and difficult role of education as a social institution. Janus-like, education must simultaneously give homage to the past and confront the often unpredictable challenges of the future. Through education the young are made heir to the vast wealth of the past--culture, tradition and knowledge. But they must also be prepared to overthrow that heritage when new problems arise which find the culture's solutions inadequate. The excruciating responsibility of education is thus simultaneously to convey the wisdom of the past and to plant the seeds of its overthrow. To use Kuhn's (1962) terms we must prepare the young to work within established paradigms as well as provide them with the wherewithal to disengage from the old paradigms and invent new ones.

It is within this context that we come to discuss inquiry. All of education is not inquiry. All of learning is not inquiry. Inquiry is a process of coming to grips with problematic situations which require the discovery of available techniques or the invention of new means for their resolutions. Whereas *learning* is Janus looking back, *inquiry* is Janus looking forward. To attempt either without benefit of the other is folly, perhaps disaster.

Yet educators often fall into endlessly futile argument over precisely this kind of either-or question against which Dewey warned. For what should education strive--process or content? discovery or guidance? learning or inquiry? Let Janus remind us as we present the account of this research that we perceive inquiry as one of the inter-related and mutually dependent facets of education and cognitive functioning. Although for the purposes of these studies we abstract inquiry from its context within other forms of cognitive and affective functioning, this is done only for the convenience of systematic research.

Probably the best way to describe what we do is to say that the object of our inquiries is other people inquiring. Before these studies can be introduced, we had better clarify what is meant by the term *inquiry* and how this process is studied in the present research.

A Model of Inquiry

Why insist on calling this process *inquiry* rather than *problem solving* or some other more traditional psychological term? Our present concept of inquiry is based upon the description of that process given by Dewey in *Logic: The Theory of Inquiry* (Dewey, 1938).

Based on Dewey's model, we divide the process of inquiry into four parts: (1) problem sensing, (2) problem formulation, (3) search and (4) resolution.

Problem sensing involves the confrontation by the subject of the potentially problematic situation and the recognition by him that a problem exists. In problem sensing we ask *whether* the subject perceives the situation as problematic, or how many problematic conditions he reacts to in the situation.

In *problem formulation*, the consciously attentive determination of what the problem entails, we ask what *kinds* of problems the subject formulates. For example, in what terms does he define the problem? What, specifically, is the problem for him? In problem formulation the terms of the inquiry are so set that the universe of data that can become evidence toward a resolution is delimited, and the form of the acceptable conclusions is anticipated.

The *search* is defined as the measurable, observable sequence of operations, questions, movements, frustrations, revisions of tactics, and the like, that the subject undertakes in order to transform the problem-as-formulated into a personally-felt resolution.

The *resolution* is that point at which the inquirer's curiosity is satiated and the inquiry ceases. It is the point at which the problematic situation that keyed off the inquiry is perceived as transformed into tolerable equilibrium.

It is very important to note at this point that the model of inquiry described above does not require a rigid sequential ordering of steps wherein all inquiries can be subdivided into four simple stages representing each of the four above-named processes. The natural process of inquiry has these four parts as somewhat independent components. Any particular inquiry will look very much like a computer program with its many loops and digressions. The steps of inquiry act as the basic operations in the program.

The terms *potential problem* and *problem* are central to this formulation. A *problem* is defined as a psychological state of discomfort or disequilibrium as sensed by an individual. The problematic state can arise from a number of possible sources. Among these are the discrepancy between an anticipated and an encountered event; the imbalance generated by the gap between desired and actual conditions, that is, between an intended goal and a current status; the ambiguity resulting from contradictory sources of information in a situation. A *potential problem* is a configuration of the environment that is intrinsically indeterminate or, in Dewey's terms "questionable," thus having a high likelihood of being perceived as problematic by an individual encountering it. When the potentially problematic is encountered and leads to feelings of disequilibrium, we say that a problem has been sensed.

The conception of inquiry described above stands in vivid contrast to the typical kinds of studies that have been conducted by psychologists under the rubric *problem solving*. The traditional way of observing problem solving behavior takes subjects individually or in groups, poses a problem situation for them, and observes their attempts to resolve that problem. In some studies the subject is presumed already to possess the necessary information to answer the proposed question and it is the manner in which he brings this information to bear upon the problem which forms the focus for research. In other studies the total universe of information to be used in the problem is arrayed for the problem solver and thus is no longer a variable. In these studies the sequence in which the subjects use the information array becomes the research focus.

Inquiry under natural conditions, however, differs in a number of major dimensions from the above experimental situations. The real world does not consist of carefully constructed situations that are presented to individuals as problems-for-solution. Instead, individuals move through an array of stimulus situations which are potentially problematic in varying degrees, selectively reacting to some and not to others. Those situations that are problematic do not present themselves one at a time in a predetermined numerical order but rather derive both their definition and the order in which they are handled from the cognitive activity of the inquirer.

Natural inquiry rarely takes place under conditions where all the elements necessary to the resolution of problems are to be found within the immediate situation in which the problem has been sensed or set. Instead, more extensive search behavior is often needed in order to gather the data necessary for the inquirer to cope with the difficulty successfully.

The problem of measurement faced in this research was, thus, to find or construct an experimental situation in which to study inquiry which would meet certain criteria. One would place a subject in a situation in which he would be faced with an array of materials, all of which could be perceived as either possessing discrepant characteristics or of being in equilibrium and thus nonproblematical. The subject would react selectively to those elements in the situation that he saw as problems and deal with them in an order and depth of his own choosing. The situation would be one with many sources of information, in order to allow the researcher to observe clearly how much and what kind of search behavior was taking place. Finally, the situation would have to be sufficiently realistic to engage the subject's emotional investment, and thus change the conditions from a non-involving intellectual exercise to a more totally immersing experience.

The attempt to meet these research demands is represented by the Teacher's In-basket.

The Inquiry Situation: The Teacher's In-Basket

The instrument developed to study individual inquiry behavior is the Teacher's In-basket, a simulated teacher's desk with its pile of potential problems. The subject, who is a female elementary school teacher-in-training, is placed at a desk and informed that she is to play the role of a new teacher who has recently been hired to take charge of a sixth-grade class. It is the middle of the semester .

(December 6) and, since the class has been handled by substitutes for the past two months, many things have piled up on her desk and have been placed in her in-basket. It is her first day in the school and no pupils are present because of a school holiday. She may begin where she likes and do as she pleases. No time limit is suggested.

There are three kinds of materials in the situation with which the subject may deal. These are (1) the contents of an in-basket, (2) the written materials, records, report cards, etc., concerning both the school and the pupils in the teacher's class and (3) the human resources that are in the situation. The human resources consist of a school secretary, a school principal and a *reference memory*, all of whom can be contacted by a phone placed on the teacher's desk.

The contents of the in-basket include phone messages, memoranda from various members of the faculty and administration, school newsletters, and research information on this sixth-grade class in the form of individual scores on a personality test and a class sociogram. These materials vary in their likelihoods of being viewed as problems by the subject and in the manners in which they are perceived as problems, if at all.

There is a memo from the school secretary, for example, that the district school psychologist has requested that all teachers submit any referrals to him that they deem necessary. Accompanying every referral, continues the school psychologists request, there should be a description of the problem and the teacher's own hunches about what may lie at the roots of the problem. Rather than the memo itself providing the potentially problematic situation, these potential problems are embedded within the materials to which the subject may turn in her attempt to cope with the request.

The subject may, in response to this memo, turn to the students' report cards or cardexes for information. The materials on one Robert Engh, for example, have embedded in them a series of potentially problematic elements which, if sensed and followed up, would lead the subject to the conclusion that Robert is an epileptic child whose family's present financial condition precludes them from purchasing the medication necessary to control his seizures. There are many potentially problematic elements embedded in the array of materials concerning this pupil which must be reacted to and dealt with to reach a complete resolution.

Another memo is from the office informing the teacher that the parents of one of her pupils will be unable to pay for their son's books until the father finds work. This is a potentially problematic situation in that it *may* be sensed as problematic and set off search behavior on the part of the subject. It may be sensed as problematic but deferred for future inquiry or stored for future reference. Or it may be seen as non-problematic and put away. Again, search would be conducted through manipulation and analysis of the inquiry materials.

These inquiry materials include sixth-grade report cards, current achievement and aptitude test scores, anecdotal reports and attendance records, all of which are immediately available to the subject in a file on her desk. The subject has also been informed that she can obtain cumulative records for the first five grades and medical records for each of her pupils. These are to be procured by phoning the school secretary. Thus, a wide range of information exists about each student, including family background, birthdate and place, six years of teachers' grades, achievement test scores, sociometric status, etc. This array of information has embedded within it hundreds of potentially problematic elements, varying from the obvious to the very obscure.

The human sources of information that are at the subject's disposal can be contacted by phone. The school secretary and principal play predetermined consistent roles in response to the requests for information and advice coming from the subject. The secretary also may be asked to place outside calls to parents, family doctors, other teachers, etc.

All the observations of behavior are made through a one-way viewing mirror, with the rooms connected through a two-way telephone exchange. All the sessions are tape-recorded. Finally, the subject is trained to *think aloud* during the entire inquiry session, which lasts approximately two and one-half hours. By employing conditioning signals (via buzzer) as reminders almost all subjects can verbalize sufficiently well to illuminate greatly the inquiry processes they are employing. The training procedure takes approximately fifteen minutes and employs materials unrelated to the in-basket.

The Variables

A behavioral scientist is rarely happy unless he can somehow translate his observations into numbers. The in-basket situation allows us to derive a number of useful quantitative measures which serve to characterize the inquiry processes observed.

Problem Sensitivity is the number of potentially problematic elements reacted to as problems by the subject.

Time is the number of minutes the subject chooses to spend in the inquiry situation. As no time limit is set and no specific task instructions are given, each subject can determine for herself when she has finished.

Materials Attended is a measure of input, the number of pieces of material to which the subject attends in the inquiry period, representing the number of "bits" processed by the subject.

Information Sources is a count of the number of *kinds* or *categories* of information brought to bear by the subject on ten selected problems in the in-basket situation.

Competence is a measure of problem resolution. It is an independent judgment of how well each subject *comes to understand* the nature of the problem situation in the same ten selected problems used to score for Information Sources.

Additional variables were generated in the course of subsequent analyses. These will be introduced at these later points.

Objectives

The Teacher's In-basket and the variables used for scoring it were developed to answer a series of research questions. The objectives of the studies reported in this volume were:

1. To identify the basic parameters of the inquiry process, their behavior and interrelations.
2. To establish the reliability and stability of those inquiry parameters.
3. To ascertain the relations among the components of the inquiry process as well as between those components and a set of other variables gathered outside the inquiry situation itself. These other variables are referred to as the determinants of inquiry and include intellectual, emotional, attitudinal, and biographical data.
4. To establish the modifiability of inquiry behavior as a function of an intervening student teaching experience where changes are examined as a function of the interaction between prior inquiry status and the nature of that student-teaching experience.
5. To establish an empirical validation of the concept of seeking styles.
6. To develop an empirically-based theory of general inquiry as well as an inquiry-relevant theory of teaching.

It was anticipated that conducting the research necessary to achieve those objectives would not only be fruitful for the study of inquiry. It was also important to examine critically the problems of research in a simulated setting which employed systematic introspection as a major tool.

Design and Procedures

The studies were conducted over a two year period. Year One was seen as developmental and exploratory. Alternate forms of the in-basket were constructed and refined. A study was conducted wherein thirty subjects were administered both in-basket forms within a single academic quarter. Results of this study were used to modify scoring procedures, increase inter-rater reliability and establish in-basket administration practices.

As part of the same study a large number of tests were employed to identify a tentative set of inquiry determinants. By and large this attempt was unsuccessful during the first year. Despite the many kinds of instruments employed--intellectual, personality, motivational, attitudinal--few relations of any substance emerged.

During Year Two subjects were selected for participation in a study of ten months' duration. One hundred thirteen female elementary education majors scheduled to student teach during the Winter Quarter took a three-hour battery of tests early in October. Fifty-one of these were selected to participate in the study because of the pattern of psychological and academic achievement characteristics they manifested. These were divided into two groups: The *dialectical* subjects, who were predicted to be effective inquirers and the *didactic* subjects, who were expected to be much less effective. This dialectical-didactic distinction was referred to as a *seeking predisposition* or *seeking style*. Cumulative college grade point average (GPA) was equated for the two groups. We thus had in effect four groups: Dialectical-high GPA, dialectical-low GPA, didactic-high GPA, and didactic-low GPA. Each of these 51 subjects, plus an additional ten who fell into no particular group, were then administered one of the two in-basket forms and a battery of individual tests.

During the Winter Quarter all 61 subjects student taught. All their supervising teachers were sent subsets of the same test battery used to select the students for our study. This enabled us to categorize student teacher-supervisor combinations in terms of degree of congruence on the inquiry-relevant predictor tests. During the Spring Quarter of Year Two all subjects, less five who dropped out, completed a second form of the in-basket.

Findings

We shall summarize the findings very briefly. Predictions that seeking predisposition would act as a more potent influence on inquiry behavior than would GPA were generally confirmed in a series of 2 X 2 factorial analyses of variance. The effect was much more evident for Administration II (post-student teaching) than for Administration I. The relations among the inquiry process variables were examined closely and distinctions among them were made.

A series of step-wise multiple regression analyses using 17 predictor variables demonstrated that the most important determinants of inquiry performance were political preferences, associational fluency, cognitive complexity, attitude structure, and verbal problem-solving ability. Much higher proportions of the variance in inquiry behavior (up to 60%) could be accounted for during Administration II than during Administration I. On the basis of these data a model was tentatively put forward in which willingness to inquire, sensitivity to the discrepant and inquiry competence were the distinctive phases of the inquiry process.

The next step in the research was development of a new set of constructs for further analysis of inquiry protocols. We had ascertained that effective inquirers spent more time in inquiry, attended to more materials, used more sources of information and sensed more problems. We now wanted a more precise description of what they actually did. Inquiry protocols were reanalyzed for amount of *cognitive shifting*, proportions of time spent in *survey* or *problem-solving*, length of *problem solving sequences* and other process measures. These analyses served further to clarify the nature of effective inquiry.

Analysis of the congruence between student teachers and their supervisors provided a series of provocative findings. When student and supervising teachers were congruent on the general measure of seeking predisposition the student's earlier style (dialectical or didactic) was reinforced on second in-basket administration. When the two were incongruent a "rebound effect" was discerned wherein student teachers became less like the supervising teacher model.

We had earlier observed that our subjects became more different after student teaching, with dialectical subjects moving further in that direction and didactics moving further toward didactic behavior. The student-supervisor "fit" added to the understanding of this phenomenon. We also observed relations between seeking style and the ratings that student teachers received from their supervisors. Dialectical seekers were rated more highly than didactic seekers.

Inquiry behavior was analyzed in relation to Kagan's (1965) dimensions of *conceptual tempo*--reflection and impulsivity. Effective inquirers were consistently more reflective than less effective inquirers, though differences were quite small.

The volume concludes with a discussion of theoretical, methodological and applied questions relating to research on the process of inquiry.

CHAPTER II

INTRODUCTION TO INQUIRY

Educational theorists have, for many years, emphasized the central nature of the concept of inquiry in the process of education. More accurately, the emphasis upon *inquiry* and *process* as basic terms in educational nomenclature has characterized the writings of major theorists in the on-going dialogue of educational controversy. Among these, the name of John Dewey is in the forefront. His work has repeatedly reflected his reaction to ideas and practices concerned solely with education as a purveyor of products -- facts, answers, and solutions. Before Dewey, the success or failure of the learner had usually been judged against an absolute scale of the proportion of the historical heritage in the arts, sciences and other bodies of knowledge he had incorporated. Education, Dewey maintained, must cast aside the Aristotelian concepts of knowledge which were directing educational thinking, and learn to think in terms of *knowing*. The objectives of education must become concerned, not only with products, but with their various directing processes.

However, Dewey's philosophy was submerged within the institutionalization of an ill-conceived and misdirected Progressive Education. When Progressive Education died of its own excesses, Dewey's conceptions of inquiry and cognitive growth were unfortunately lost as well.

The recent period has witnessed a renaissance of interest in education for inquiry. The new mathematics and science curricula have repeatedly emphasized the importance of process objectives (Schwab, 1964; Bruner, 1960; Gagne, 1965). Educational researchers are exploring the psychological characteristics and determinants of inquiry behavior (Suchman, 1967; Allender, 1968) and of productive thinking (Crutchfield and Covington, 1963) in a manner which parallels the curriculum development activities directed at those processes as objectives. It would seem that the *Zeitgeist* had proclaimed a new epoch of both educational and behavioral science interest with the processes by which men cope with, come to understand and proceed to extend their knowledge of the world around them.

Psychologists have studied aspects of the inquiry process in research on problem-solving. Extensive research on problem-solving has been conducted, among others, by Duncker (1945), Maier (1936), Wertheimer (1945) and Bloom and Broder (1950). They urged that researchers in the cognitive area, and problem-solving in particular, focus on the processes employed by the subjects in their studies, as against simply distinguishing those whose solutions were correct from those whose solutions were incorrect. Bloom expresses this in the following selection.

> . . . What is missing is information on the process by which the problems are solved. The methods of attack, the steps in the thinking process, the kinds of considerations used to make one choice rather than another, and the feelings and attitudes of the subject are neglected or given very little question. The products of thought--the answers to the questions or the solutions to the problems--plus the observations may give the tester a fleeting glimpse into the complex processes of thought involved, but usually this is incomplete and almost of necessity, inaccurate.
>
> If it were established that the evidence on overt behavior or the products of thought had a clear-cut and definite relationship to the mental processes which produced them, the psychologist would appear to have ample justification for limiting his data to such objective and easily observed phenomena. However, even the most simple exploratory studies on responses to test questions reveal that the same solution or product of thought may be arrived at by distinctly different processes of thought. (Bloom and Broder, 1950; pp. 1-2)

Bruner, Goodnow and Austin (1956) paralleled Bloom's concerns in their *Study of Thinking*. They investigated the learning of concepts, not merely from the vantage point of the effects of various presentation modes or rate of learning, but with an emphasis on the *strategies* of concept attainment used by their subjects. They asked what subjects were doing in order to attain concepts of particular kinds. They studied the consequences of experimental manipulations for the strategies or processes directing concept attainment.

A Model of Inquiry

The concern of the present research is with the process of inquiry. Why insist on calling this process *inquiry* rather than *problem solving* or some other more traditional psychological term? Our present concept of inquiry is based upon the description of that process given by Dewey in *Logic: The Theory of Inquiry* (Dewey, 1938). Based on Dewey's model, we divide the process of inquiry into four parts: (1) problem sensing, (2) problem formulation, (3) search and (4) resolution.

Problem sensing involves the confrontation by the subject of the potentially problematic situation and the recognition by him that a problem exists. In problem sensing we ask *whether* the subject perceives the situation as problematic, or how many problematic conditions he reacts to in the situation.

In *problem formulation*, the consciously attentive determination of what the problem entails, we ask what *kinds* of problems the subject formulates. For example, in what terms does he define the problem? What, specifically, is the problem for him? In problem formulation the terms of the inquiry are so set that the universe of data that can become evidence toward a resolution is delimited, and the form of the acceptable conclusions is anticipated.

The *search* is defined as the measurable, observable sequence of operation, questions, movements, frustrations, revisions of tactics, and the like, that the subject undertakes in order to transform the problem-as-formulated into a personally-felt resolution.

The *resolution* is that point at which the inquirer's curiosity is satiated and the inquiry ceases. It is the point at which the problematic situation that keyed off the inquiry is perceived as transformed into tolerable equilibrium. Operationally, resolution can be a point in time, a perceived last step, or a level of conceptual determinacy. Resolution differs for different subjects because the perception of indeterminacy and determinacy is dependent upon individual sensitivities to the discrepant and the harmonious, the terms in which the discrepant is formulated as a problem by each individual, the character and content of individual searches, the manner in which feedback of different kinds is allowed to affect and modify earlier formulations, and on individual differences in general curiosity satiation levels. All these characteristics can be seen as, to some extent, determinants of individual differences in inquiry behavior.

It is very important to note at this point that the model of inquiry described above does not require a rigid sequential ordering of steps wherein all inquiries can be subdivided into four simple stages representing each of the four above-named processes. The natural process of inquiry has these four parts as somewhat independent components. Any particular inquiry will look very much like a computer program with its many loops and digressions. The steps of inquiry act as the basic operations in the program. Thus, it would not be unlikely for a given subject to sense that a particular problem exists, proceed to formulate it in a particular way, initiate search activity in order to gather data concerning the problem, realize as a result of the initial search that his problem formulation is misbegotten, return and reformulate the problem, while doing so sense an additional problem or two, thus reformulate once again, and so on. Hence, this process would look very much like one of the complex TOTE diagrams discussed by Miller, Galanter and Primbram, in their *Plans and the Structure of Behavior* (Miller, et al, 1960).

The terms *potential problem* and *problem* are central to this formulation. A *problem* is defined as a psychological state of discomfort or disequilibrium as sensed by an individual. The problematic state can arise from a number of possible sources. Among these are the discrepancy between an anticipated and an encountered event; the imbalance generated by the gap between desired and actual conditions, that is, between an intended goal and a current status; the ambiguity resulting from contradictory sources of information in a situation. A *potential problem* is a configuration of the environment that is intrinsically indeterminate or, in Dewey's terms "questionable," thus having a high likelihood of being perceived as problematic by an individual encountering it. When the potentially problematic is encountered and leads to feelings of disequilibrium, we say that a problem has been sensed. It is apparent that the potentiality of a problem situation (perceived as a function of the likelihood of it leading to problem sensing) can be scaled consensually along a continuum from the obviously problematic on one extreme to situations where the likelihood of problem sensing seems quite infinitesimal at the other extreme. It is when we reach the latter pole of the continuum that we raise questions of either creativity or hallucination.

The conception of inquiry described above stands in vivid contrast to the typical kinds of studies that have been conducted by psychologists under the rubric *problem solving*. The traditional way of observing problem solving behavior takes subjects individually or in groups, poses a problem situation for them, and observes their attempts to resolve that problem. In some studies the subject is presumed already to possess the necessary information to answer the proposed question and it is the manner in which he brings this information to bear upon the problem which forms the focus for research. In other studies the total universe of information to be used in the problem is arrayed for the problem solver and thus is no longer a variable.

Inquiry under natural conditions, however, differs in a number of major dimensions from the above experimental situations. The real world doesnnot consist of carefully constructed situations that are presented to individuals as problems-for-solution. Instead, individuals move through an array of stimulus situations which are potentially problematic in varying degrees, selectively reacting to some and not to others. Those situations that are problematic do not present themselves one at a time in a predetermined numerical order but rather derive both their definition and the order in which they are handled from the cognitive activity of the inquirer.

Natural inquiry rarely takes place under conditions where all the elements necessary to the resolution of problems are to be found within the immediate situation in which the problem has been sensed or set. Instead, more extensive search behavior is often needed in order to gather the data necessary for the inquirer to cope with the difficulty successfully. Also, natural inquiry rarely has as its subject matter Bruner's figure-concepts or Duncker's candles. More often the inquirer is operating with his ideas and feelings focused upon matters in which he has an emotional investment, such as a doctor with his patients, a teacher with her students, a lawyer with his clients, etc. This affect-invested inquiry may differ markedly from the same individual's problem-solving activities in relation to, say, the area of a parallelogram.

The problem of measurement faced in this research was, thus, to find or construct an experimental situation in which to study inquiry which would meet certain criteria. One would place a subject in a situation in which he would be faced with an array of materials, all of which could be perceived as either possessing discrepant characteristics or of being in equilibrium and thus nonproblematical. The subject would react selectively to those elements in the situation that he saw as problems and deal with them in an order and depth of his own choosing. The situation would be one where there were many sources of information, in order to allow the researcher to observe clearly how much and what kind of search behavior was taking place. Finally, the situation would have to be sufficiently realistic to engage the subjects' emotional investment, and thus change the conditions from a non-involving intellectual exercise to a more totally immersing experience.

Given such a setting in which to study inquiry, we could then proceed to the two-fold objectives of this research: (1) to describe the process of inquiry in fuller and richer form than had previously been possible, especially the stages of problem sensing and search; and (2) to identify the determinants and modifiability of the inquiry process. The theoretical considerations which directed our thinking about the determinants of inquiry behavior from the subject matter of the balance of this chapter. A description of the research setting used to study inquiry and the variables developed to measure aspects of inquiry behavior is presented in Chapter III.

The Determinants of Inquiry Behavior

During the past fifteen years, a great deal of research effort has been directed toward increasing our understanding of the relationships between different personality types or attitude structures and the general manner in which individuals mediate the world around them cognitively.

Stern, Stein and Bloom (1956) were influenced greatly by the studies of the authoritarian personality (Adorno, Frenkel-Brunswick, et al, 1950). They developed a variation of the authoritarian "F scale" which, for them, distinguished between "stereopathic" and "non-stereopathic" personalities. These personality types were analogous to the authoritarian and non-authoritarian, but were not as closely identified with highly conservative political beliefs as were Frenkel-Brunswick's. They examined these types in the light of their activities, their behaviors on a battery of cognitive tests, and their relative successes as undergraduates at the College of the University of Chicago. One of their most important findings, in the light of the purposes of the present study, was the much higher degree of success of the non-stereopaths in the non-structured, relatively undisciplined program of the College. The stereopaths showed much greater difficulty coping with this generally undirected setting. Non-stereopaths tended to achieve much more successfully on the college comprehensive examinations than did the stereopaths, even when general aptitude was held constant. These tests emphasized problem solving and inference far more than memory for detail. Furthermore, in discussions with advisors, non-steropaths seemed to like best about the university precisely those things which led stereopaths to consider leaving.

Witkin and his associates (1954) focused upon the relationships among personality characteristics and perceptual styles. Among the most important constructs used by Witkin were *field independence* and *field dependence*. Using both new techniques of his own design and older embedded figures techniques originally developed by Gottschaldt in the early 1920's, he determined that there was a consistent relationship between difficulties in perceiving a simple figure embedded in a complex ground and the manifestation of dependency as a salient personality characteristic. Thus, Witkin, in studying the relationship between personality and perception, attempted to focus his attention on the stages of cognitive functioning that generally precede active inquiry or problem-solving *per se*, the perceptual screening of the stimuli in the individual's environment. These perceptual variables are, however, of major importance in the research on cognitive functioning because any problematic situation must be perceived before it can be attacked and solved. This apparently obvious statement is not without significance, when seen in the light of the standard techniques of cognitive research, all of which begin with a problem being *presented* to a subject for solution. It is very likely that, in so doing, the researcher fails to observe aspects of the inquiry process that are crucial to understanding individual differences in these processes.

The Concept of Risk

The study of cognitive behavior also suggests that, in problem-solving or inquiry, the individual is called upon to interact with the unknown, or at least, the unpredictable. Whenever we discuss such behavior involving consequences of an unknown or unpredictable nature, the concept of risk becomes relevant. In fact, one of the criteria by which Bruner and his coworkers (1956) distinguished the concept-attainment strategies he studied was the extent to which they were risk-regulating. By risk-regulating, he denoted the degree to which a given seeking-strategy guaranteed a useful outcome, or was more risky and thus allowed the possible outcomes to vary.

Research in this area has generally involved the study of goal-setting behavior. The extent to which an individual's set goal exceeds his best previous efforts, and thus involves greater risk or failure, is termed his *level of aspiration*. An article by Lewin, Dembo, Festinger and Sears stated a theory of goal-setting behavior in order to explain the research results up to that time in level of aspiration studies. Lewin and his colleagues conclude their analysis with some general statements about level of aspiration.

> . . . These theoretical considerations show that most of the qualitative and quantitative results related to the level of aspiration can be linked to three factors, namely, the *seeking of success*, the *avoiding of failure*, and the *cognitive factor of probability judgment*. These forces operate in a setting which has to be characterized as a choice for a future objective. The strength of these forces and the values corresponding to the subjective probability depend on many aspects of the life space of the individual at that time, particularly on the way he sees his past experiences and on the scales of reference which are characteristic for his culture and his personality. (Lewin, *et al.*,1941, pp.376)

Thus, Lewin presents a goal-setting, risk-taking model which is related to the manner in which an individual makes a "choice for a future objective." The choice between "seeking of success" and "avoiding of failure" will be a consequence of an individual's "past experience and on the scales of reference which are characteristic of his culture and his personality." Where he is on this modality continuum contributes greatly to the determination of how he will act in the face of uncertainty, and how he will set his goals and select his ends. For the present purposes, the significance of such modal distinctions lies in our assumption that the decision to engage in cognitive activities such as problem-solving or inquiry involves the same kind of two-factor choice model that is appropriate when discussing aspirational or goal-setting behavior.

Individual Differences in Inquiry Behavior

The problem to which this study is addressed is that of systematically analyzing and classifying inquiry processes. The term "seeking style" will be used to denote a consistent mode of initiating, conducting and terminating an inquiry that is characteristic of individuals or groups of individuals. These styles, it is theorized, are related to more general systems of values, attitudes and cognitive skills that predispose the individual toward his particular style of seeking behavior and are viewed as the determinants of inquiry behavior. Seeking styles are seen as varying along a continuum from the *dialectical* to the *didactic*.

The terms *dialectical* and *didactic* are used somewhat idiosyncratically in this context and a word of explanation may be welcome. The etymology of these terms, for the author, stemmed from an original desire to characterize different styles of teaching. He observed that teaching styles could be distinguished by the amount of flexibility they allowed, the probability of the occurrence of the unexpected, the extent to which teaching was externally imposed or interactionally developed, etc. At one extreme appeared the *didactic* teacher, very orderly and precise, lecturing authoritatively, allowing little deviation from the expected and planned. At the other extreme stood the *dialectical* teacher, who focused on problems rather than solutions, interacted considerably with the students through discussions, readily roamed far and wide over the course materials and allowed for the unexpected at all times.

While attempting to clarify these distinctions and their implications, it became apparent that these types were more than simply differences in teaching style. These were types who would differ in their handling of any problematic situation. The notion of a generalized "seeking style" was then developed to reflect these differences in approaching and dealing with problems, and the original terms, dialectical and didactic, were retained.

Underlying the *dialectical seeking style* is that manner of interacting with one's environment where the objects of one's attention are predominantly the complex, ambiguous and uncertain elements of the environment. Lewin discusses goal-setting behavior in terms that parallel closely the present conception of the dialectical style. He characterized an individual who is willing to set goals for himself that substantially, though not imprudently, exceed his best previous effort. He is willing to do so because, for him, success as a positive goal is more attractive than the contemplation of possible failure is painful. In Lewin's terms, the dialectical seeker's life space either has fewer barriers, or the barriers that are there are perceived as surmountable, given his available tools. Since problems as a class of occurrences are thus less threatening to him, he is more willing to recognize and then deal with an uncertain situation when it occurs, than is the individual whose seeking style is at the didactic end of the continuum.

Related to these characteristics, is the dialectical seeker's greater "openness" to his environment. He prefers to operate in what Schachtel (1959) calls the "allocentric mode," a perceptual and cognitive attitude in which one interacts with the objects in an environment, not only as objects-of-use when in a drive state, but also for the experience of exploring and manipulating objects in that environment. Such an openness allows the dialectical seeker to respond to a much wider range of potential stimuli and to react with greater flexibility and variability to their appearance. This allocentricity is also reflected in the greater field independence of the dialectical seeker, who is less impulsively and compulsively driven by external or internal demands in a situation. He is better able to relate to the environmental object in its entirety, rather than only in terms of its immediate use, and can approach it flexibly from different directions, seeing it now from this, later from that perspective. His relatedness to the world is thus characterized by general explorativeness and playfulness.

Underlying the *didactic seeking style* is that manner of interacting with the environment which strives for more immediate, certain and unambiguous closure, avoiding situations in which the unpredictable elements dominate. Complexities, ambiguities and uncertainties are reacted to as situations to be handled by the application of "one right answer" which is assumed already to exist. Bloom and Broder describe many of their poor problem solvers in this manner. The didactic seeker is much more concerned with avoiding an ever-present failure than he is concerned with achieving a major success. He risks rarely, and when he does, he risks less. He perceives the probability of any failure as much more likely than does the dialectical seeker, and thus avoids interactions with the unfamiliar and the unknown.

In Schachtel's terms, his behavior is best characterized by the rigid, "autocentric attitude."

> The anxiety of the encounter with the unknown . . . arises also, perhaps primarily, from the person's fear of letting go of the *attitudes* to which he clings for safety, of the *perspectives* which these attitudes give him on the world, and of the familiar *lables* for what he sees in the world. . . . The attitude determines what will and will not be perceived and how it will be perceived. An attitude to which one clings will permit one to see only certain limited or distorted aspects of an object and will block a fuller view. Only when this attitude is let go and the person thus set free from having to approach the world in this particular way, is the path free to a different approach and a view thus opened up on hitherto unknown aspects of the object.
>
> Holding on to an attitude, thus, prevents perceptive openness toward the constantly changing flux of life and tends to distort perception in the direction of a closed, one-sided, rigid view of the world corresponding to the rigidity of the attitude held. . . . The rigid attitude entails fear of chaos, of the unknown, unmanageable; rigidity and fear of chaos go together, just as flexibility development, transformation, and openness toward the world ' (allocentric perception) belong together.
>
> . . . We can just avoid the unknown, unfamiliar by *not* looking, *not* thinking. But when it impinges on us forcefully, . . . we very much want to transform it into something known by linking it up with our familiar frame of reference. As soon as we have succeeded in this . . . it no longer alarms or disquiets us; . . . and reassured, we turn away from it (Schachtel, 1959, pp. 195,199, 203).

This combination of a depersonalized, closed relationship to the environment, a rigid field dependence, and an avoidance of exploratory behaviors, characterize the autocentric attitudes and are major components of the didactic seeking style.

It must be clearly understood that no individual constantly manifests either the allocentric or autocentric attitude. Individuals shift back and forth between them, but with one or the other generally being more consistently employed. Thus, to speak of someone as a didactic seeker, for example, does not preclude his fairly frequent employment of the dialectical mode in certain situations.

Seeking Styles and Inquiry

When an individual is faced with a situation which must be categorized before he can determine whether some specific behavior is called for on his part, he will tend to pick up cues that will allow him to classify it in his most commonly exercised schemata. In the case of a potentially problematic situation, the schemata involved would be "problems" and "no problems." One can expect that the range of experiences that the dialectical seeker would perceive, and hence, categorize as "problematic" would be much broader than the parallel range for the didactic seeker. As Dewey states, "The indeterminate situation becomes problematic in the very process of being subjected to inquiry. . . . The first result of the evocation of inquiry is that the situation is taken, adjudged, to be problematic. To see that a situation requires inquiry is the initial step in inquiry." Thus, basic differences between didactic and dialectical seekers in their openness to this initial stage of inquiry will be of major concern in the present research, and will have major consequences for differences in their inquiry processes.

A basic assumption of this view of coping and seeking is that, in any situation, an individual will attempt to transform the problematic and uncertain into a state that corresponds most closely to that picture of the universe with which that individual is most comfortable. Given their contrasting world views and assuming, with Dewey, that "Inquiry is the controlled or directed *transformation* of an indeterminate situation into one that is so determined. . ," we would expect both groups to have different perceptions of what constitutes an adequate resolution of the indeterminancy. "The way in which the problem is conceived decides what specific suggestions are entertained and which are dismissed; what data are selected and which rejected;

it is the criterion for relevancy and irrelevancy of hypotheses and conceptual structures."

Differences in seeking style will manifest themselves in this stage of problem formulation in the relative abilities of subjects to make themselves independent of and reorganize the problematic field in order to generate what Duncker calls a "search model" that will guide their seeking and anticipate their resolution.

Subjects with these differing seeking styles will, therefore, operate differently within the ongoing inquiry itself, engaging in different sequences or patterns of search. Within their different formulations and search models, the search patterns utilized by the dialectical seekers ought to exhibit much greater variability of attack and order, in contrast to the didactic seekers' preference for a repetitively consistent and narrower pattern. The didactic seeker may be a more *efficient* searcher, by the criterion of the least needless effort, because he will minimize the exploratory and playful aspects of the search. These different seeking styles and attitudes--dialectical and didactical--will thus lead to different problem *resolutions*, both in content and in kind.

Objectives

The objectives of the present study are:

1. To identify the basic parameters of the inquiry process, their behavior and interrelations.
2. To establish the reliability and stability of those inquiry parameters.
3. To ascertain the relations among the components of the inquiry process as well as between those components and a set of other variables gathered outside the inquiry situation itself. These other variables are referred to as the determinants of inquiry and include intellectual, emotional, attitudinal, and biographical data.
4. To establish the modifiability of inquiry behavior as a function of an intervening student teaching experience where changes are examined as a function of the interaction between

prior inquiry status and the nature of that student-teaching experience.

5. To establish an empirical validation of the concept of seeking styles.
6. To develop an empirically-based theory of general inquiry as well as an inquiry-relevant theory of teaching.

Summary

In this chapter we have attempted to outline a theory of inquiry and the conditions of individual differences in a number of domains that would lead to contrasting patterns of inquiry performance. The differences between the process of inquiry as an object of psychological study and those processes traditionally denoted by the term problem-solving were discussed. The consequences of the differences between inquiry and problem-solving were clarified in terms of the problems raised for measuring the processes. Finally, the objectives of the current investigations were outlined.

The next chapter describes in detail the methods developed to study the inquiry process in the present investigation and the variables generated by use of that method for characterizing inquiry performance. The design of two years of research on the characterization, prediction and classification of inquiry behavior is then presented.

CHAPTER III

RESEARCH METHODS

In Chapter II we described the process of inquiry and the kinds of difficulties which would attend its systematic investigation. We also advanced a series of formulations which attempted to characterize the types of individuals who would reflect different kinds of inquiry performance. What procedures are we prepared to use to study inquiry? How are individual differences therein to be identified? We shall now describe such an investigative technique and the research design in which it was employed.

Search for a Method

It will be recalled that the major criteria for selecting an instrument for the study of inquiry were that it (1) allow for the observation of problem sensing, (2) maximize amount of observable search behavior, (3) simulate a real-life problem solving situation and thus (4) elicit a measure of emotional involvement from the subject.

A number of experimental techniques for studying problem-solving or inquiry behavior were examined in the search for an appropriate instrument. The work of Rimoldi (1960) utilizes the tab-item method of studying problem-solving processes. In his research Rimoldi poses a problem of medical diagnosis to the subject and an array of possible questions which he might wish to ask in this case. In the medical example these questions might include history details, physical examination particulars, laboratory tests, X-rays, etc. Beside each of these listed questions is a removable tab, underneath which lies the obtained result of asking the accompanying question. For example, the question of, "What is the patient's blood pressure?" may be asked and the adjoining tab lifted. The information under the tab may read "120/75." In terms of the criteria for studying inquiry, Rimoldi's method, while maximizing the observable search behavior of the subject, and being quite involving, especially for medical students, still presented major difficulties. First, the problems to be solved were clearly delineated, and the array of questions to be asked were just as clearly indicated. A subject did not sense a problem; it was presented to him. A subject did not have to search for questions to ask; they were listed for him. He needed only to select among the many posed. This further emphasized the artificiality of the situation.

J. R. Suchman (1961), in his studies of inquiry training, presents his subjects with problematic situations in the form of filmed scientific experiments whose specifics are inherently puzzling. He then asks his subjects, "Why did X happen?" In contrast to Rimoldi, the array of questions to be asked is not specified. However, subjects may only ask questions answerable by "Yes" or "No." Although the Suchman technique shows great promise as a training device to teach children how to inquire, as an experimental technique for studying inquiry it shares the limitations of Rimoldi's method.

Despairing of finding a technique for studying "problem-solving" processes that would be satisfactory for studying the total inquiry process, the authors turned to examination of a technique utilizing a realistic setting which maximized the need for the subject to determine where he would begin and how he would proceed for himself. This method was the "Administrator's In-Basket" developed by Frederiksen and his colleagues (1957). Here, the subject plays the role of an educational administrator in his first day on a new job. The subject has already read a detailed description of the situation in which he will operate, including geographic and demographic characteristics of the locality in which his school is located, descriptions of the faculty he will work with, etc. The immediate problem field is the contents of his "in-basket," which includes letters from parents, memoranda, and many other communications which may be perceived as calling for action on the part of the administrator. The subject may take any action in response to the contents of the in-basket. Frederiksen scored his subjects' responses in terms of a set of categories for classifying the kinds of decisions made by the administrator, e.g., to reserve judgment while sending for more information, to delegate responsibility, or to write a letter.

Hemphill, Griffiths and Frederiksen (1962) moved this in-basket research forward markedly with their study, *Administrative Performance and Personality*. The in-basket scoring system was revised and refined. An important distinction was made between scoring for "stylistic categories" and for "content categories." As the authors distinguish them, ". . . content refers to substance, the courses of action taken; for example, the principal called a meeting, refused a teacher's request. . . . Style refers to attributes; thus a particular course of action. . . could be done courteously or with formality; . . . it could be done in writing, by telephone, or in face-to-face conversation. . ." (ibid., p. 86) The theoretical model most effective in generating style variables was that of "decision-making."

In addition to the improvement of the scoring procedures, the authors investigated the relationships of psychological characteristics, e.g., personality, interests, intelligence, etc. to in-basket performance. They felt that an understanding of how the described in-basket behaviors related to these psychological measures enriched their understanding of the variety of administrative performances observed in their research.

The inbasket technique was promising because it did not necessarily specify the problems to be handled, or their necessary order. It left room for potential problems, to which some subjects reacted, and others did not. From the senior investigator's own experience with this technique, he knew that it was very involving and realistic. By including an examination of the psychological correlates of administrative behavior, the authors provided a much better understanding of the processes studied than could have been provided by a description alone.

The major shortcomings of this in-basket approach *for the study of inquiry processes* were that (1) subjects' scores did not reflect the sequence of steps undertaken, as they were not observed individually; (2) the thought processes of subjects were not accessible, since no "thinking aloud" technique was employed; (3) the "Administrator's In-Basket" variables were highly specific and often tied directly into administrative behavior, while the study of inquiry processes required variables more easily generalizable to underlying psychological processes; and (4) most of the information-seeking of subjects took place *prior* to their in-basket performance and hence was unobservable.

Shulman (1965) adapted the in-basket situation to the study of inquiry processes by developing a new in-basket, which included a range of potentially problematic situations which could be reacted to by the subjects, a role-playing set to engage their emotional investment, and a universe of internal and external information sources which they could manipulate in their inquiries. With this technique, he attempted to study the total inquiry process, rather than the truncated form of inquiry generally denoted by the term "problem-solving." He focused upon variables which were much more similar to the "stylistic categories" of Hemphill, Griffiths and Frederiksen than to their "content categories."

A detailed description of the instrument so developed, and the manner in which it was used, is given in the next section. Through its use, it was possible to examine some heretofore unobserved elements of the inquiry process, in their relationships to other inquiry elements, and under conditions much more analogous to a "natural" inquiry situation.

In Shulman's research a group of 101 female senior teacher trainees from four Chicago area universities were screened with a battery of tests which measured those variables thought to underlie individual seeking style differences. These variables included measures of field independence, stereopathy, creativity and academic aptitude. This was done in order to select a sample of subjects for observation in an in-basket inquiry situation. The sample selected consisted of 22 subjects who represented extreme differences in the characteristics underlying seeking behavior. As much as possible, aptitude was held constant.

Hypotheses were offered predicting inquiry pattern differences between the two screening groups, independent of aptitude, as measured by the process variables elicited using the in-basket technique. These variables included problem sensitivity, amount of information sought, the flexibility with which information was utilized, the amount of material attended to by the subject, the speed with which materials were processed, the amount of time spent in inquiry, and the judged competence of the subject as an inquirer. Most of the hypotheses were supported by significant differences in the predicted direction between the mean scores on the inquiry process variables for the two groups. In addition, significant correlations were found between the screening measures utilized to select the sample and the inquiry process measures. The new measures of inquiry process were also found to be highly reliable. Intercorrelations among the inquiry process variables themselves were high, suggesting the existence of consistent seeking style tendencies. These were further supported when a number of individual cases were examined, and consistent, intuitively meaningful relationships were observed. Shulman's research confirmed the usefulness of an in-basket technique for the study of teacher inquiry behavior. The present research utilizes analogous techniques in order to investigate more extensively the characteristics and modifiability of teacher inquiry processes. In the next section we will describe the technique developed by Shulman, its administration and scoring.

The Inquiry Situation: The Teacher's In-Basket

The instrument developed to study individual inquiry behavior is the Teacher's In-basket, a simulated teacher's desk with its pile of potential problems. The subject, who is a female elementary school teacher-in-training, is placed at a desk and informed that she is to play the role of a new teacher who has recently been hired to take charge of a sixth-grade class. It is the middle of the semester (December 6) and, since the class has been handled by substitutes for the past two months, many things have piled up on her desk and have been placed in her in-basket. It is her first day in the school and no pupils are present because of a school holiday. She may begin where she likes and do as she pleases. No time limit is suggested.

There are three kinds of materials in the situation with which the subject may deal. These are (1) the contents of an in-basket, (2) the written materials, records, report cards, etc., concerning both the school and the pupils in the teacher's class and (3) the human resources that are in the situation. The human resources consist of a school secretary, a school principal and a *reference memory*, all of whom can be contacted by an intercom placed on the teacher's desk.

The contents of the in-basket include phone messages, memoranda from various members of the faculty and administration, school newsletters, and research information on this sixth-grade class in the form of individual scores on a personality test and a class sociogram. These materials vary in their likelihoods of being viewed as problems by the subject and in the manners in which they are perceived as problems, if at all. Table 1 reports the contents of one form of the Teacher's In-basket.

There is a memo from the school secretary, for example, that the district school psychologist has requested that all teachers submit any referrals to him that they deem necessary (A-9). Accompanying every referral, continues the school psychologist's request, there should be a description of the problem and the teacher's own hunches about what may lie at the roots of the problem. Rather than the memo itself providing the potentially problematic situation, these potential problems are embedded within the materials to which the subject may turn in her attempt to cope with the request.

The subject may, in response to this memo, turn to the student's report cards or cardexes for information. The materials on one Robert Engh, for example, have embedded in them a series of potentially problematic elements which, if sensed and followed up, would lead the subject to the conclusion that Robert is an epileptic child whose family's present financial condition precludes them from purchasing the medication necessary to control his seizures. There are many

TABLE 1

CONTENTS OF INBASKET FORM A

A- 1.	Brief description of Ridge Forest's Jefferson school district and major characteristics of the community such as distribution of SES in different areas.
A- 2.	Map of the community indicating location of students' residences.
A- 3.	Calendar indicating the date as December 6, 1965.
A- 4.	Phone memo from Gloria's mother. Wants teacher to suggest a good social studies text for tutoring Gloria. Last name of caller was not noted.
A- 5.	Phone memo from Mrs. Rogers (room mother) asking if teacher will attend the next PTA meeting.
A- 6.	Phone memo from Mrs. Becker inviting teacher to dinner on December 10.
A- 7.	Phone memo from Mrs. Rollins inviting teacher to dinner that Friday night.
A- 8.	Letter to principal which was forwarded to the teacher indicating that Rosalie Grier is moving to Indianapolis and will enroll in school there after Thanksgiving. The letter, from her new principal, requests information about Rosalie from the teacher.
A- 9.	Memorandum from the principal indicating that the school psychologist is coming to Jefferson School on December 13. December 6 (today) is the deadline for submitting referrals. Referrals should include teacher's own hunches about the roots of childrens' problems.
A-10.	Sociogram of class taken a month before.
A-11.	Summary of students' scores on the California Test of Personality. Attached are some rough guidelines for interpretation of scores.
A-12.	Drawing of teacher with obscene caption which was taken from Howard Gorman by substitute teacher. Note from teacher is attached.
A-13.	Memorandum from the principal requesting the names of students to be referred to special enrichment or remediation sections being established.
A-14.	Memorandum from school secretary indicating that a letter has been received from Robert Engh's parents saying that they would be unable to pay for Robert's books until his father found work.

potentially problematic elements embedded in the array of materials concerning this pupil which must be reacted to and dealt with to reach a complete resolution.

Another memo is from the office informing the teacher that the parents of one of her pupils will be unable to pay for their son's books until the father finds work (A-14). This is a potentially problematic situation in that it *may* be sensed as problematic and set off search behavior on the part of the subject. It may be sensed as problematic but deferred for future inquiry or stored for future reference. Or it may be seen as non-problematic and put away. Again, search would be conducted through manipulation and analysis of the inquiry materials.

These inquiry materials include sixth-grade report cards, current achievement and aptitude test scores, anecdotal reports and attendance records, all of which are immediately available to the subject in a file on her desk. The subject has also been informed that she can obtain cumulative records for the first five grades and medical records for each of her pupils. These are to be procured by calling the school secretary. Thus, a wide range of information exists about each student, including family background, birthdate and place, six years of teachers' grades, achievement test scores, sociometric status, etc. This array of information has embedded within it hundreds of potentially problematic elements, varying from the obvious to the very obscure.

The human sources of information that are at the subject's disposal can be contacted by phone. The school secretary and principal play predetermined, consistent roles in response to the requests for information and advice coming from the subject. The secretary also may be asked to place outside calls to parents, family doctors, other teachers, etc.

An additional source of information for the subject is her *reference memory*, a talking alter ego with a storehouse of facts, who knows everything the subject *would* know, had she read the teacher's handbook, been interviewed by members of the school administration, attended teachers' meetings and orientations, gossiped with other teachers, and the like. She can consult this reference memory as often as she likes, in the same way as she would, in fact, tap her own memory. She speaks to this reference memory by intercom. The manner in which the subject utilizes this reference memory casts considerable light upon her inquiry thought processes.

Once an incongruity has been confronted by the subject, her problem formulation can be at a number of levels, e.g., how to alleviate an uncomfortable situation, how best to restore the *status quo ante;* or how to reorganize the total situation, not only to restore an older order but to strive for some improved level of equilibrium. The formulation of the problems determines the area and extent of the searches--how much and how many kinds of information the subject will utilize in her subsequent inquiry behavior, and to what level of resolution she will strive. It is behaviors such as these that are observed and assessed.

All the observations of such behavior are made through a oneway viewing mirror, with the rooms connected through a twoway intercom. All the sessions are tape-recorded. An interview follows the inquiry session of each subject in order to clarify the reasons why the subject made certain decisions at certain times, or used given pieces of evidence to infer specific conclusions or to fill in gaps in our understanding of her processes.

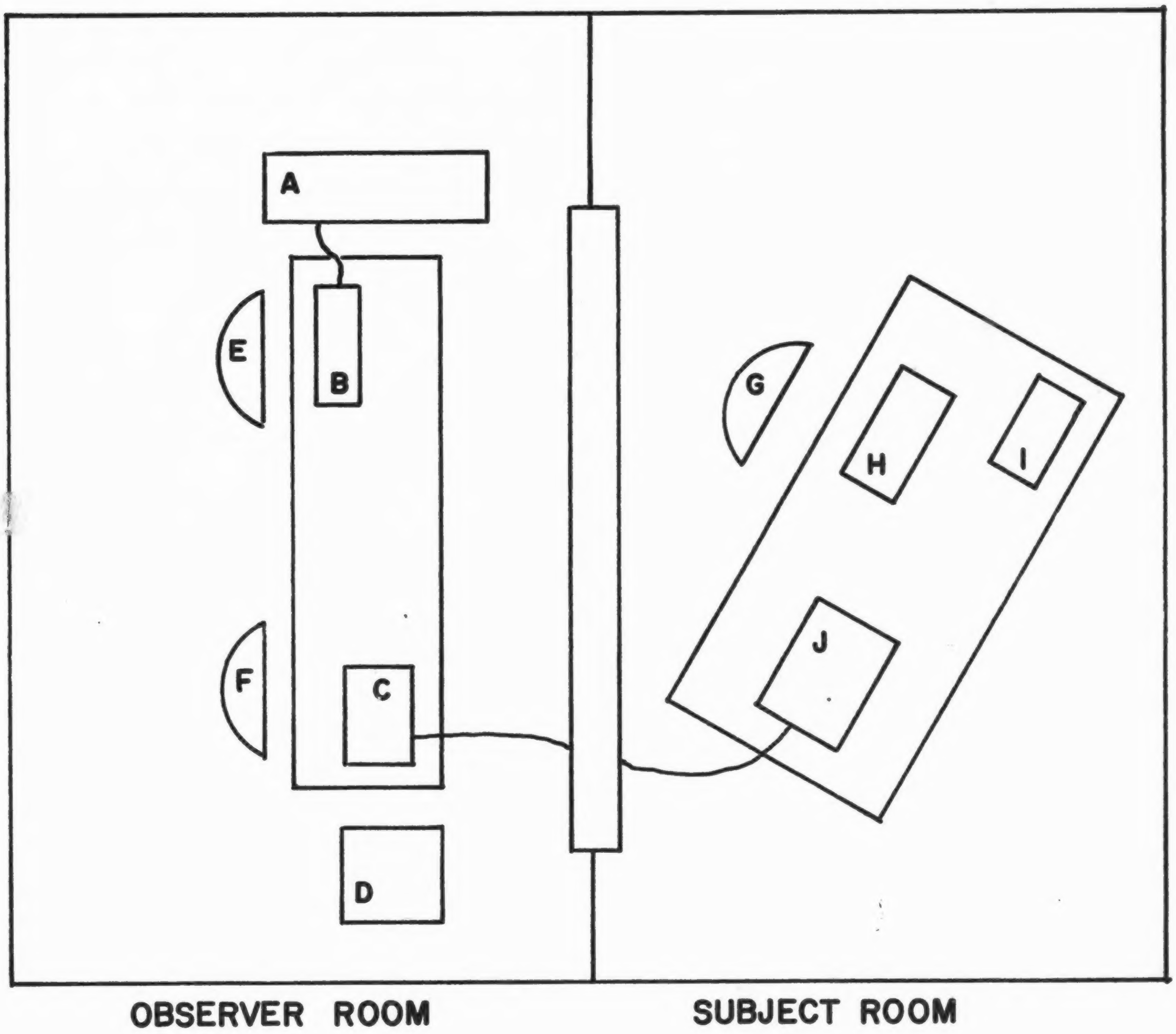
Finally, the subject is trained to *think aloud* during the entire inquiry session, which lasts approximately two hours. By employing conditioning signals (via buzzer) as reminders almost all subjects can verbalize sufficiently well to illuminate greatly the inquiry processes they are employing. The training procedure takes approximately fifteen minutes and employs materials unrelated to the in-basket. Figure 1 is a schematic drawing of the research setting, showing the relationship betwen the subject and observers.

Observation and Scoring

Each in-basket was administered, observed and scored by two experimenters. The experimenters observe the subject's behavior

SCHEMATIC DIAGRAM
OF THE RESEARCH SETTING

FIGURE I


A
B
E
C
F
D
G
H
I
J
OBSERVER ROOM
SUBJECT ROOM

A - AUTOMATIC TIMER-COUNTER
B - OBSERVER SCORING PANEL
C - INTERCOM UNIT
D - AUDIO TAPE RECORDER
E - OBSERVER
F - OBSERVER

G - SUBJECT
H - FILES AND WORKING MATERIALS
I - SUBJECT'S IN-BASKET
J - INTERCOM UNIT

through a one-way mirror. All of the subject's verbalizations are picked up by a highly sensitive microphone and tape recorded. One experimenter plays the role of school secretary and handles all communications with the subject over the intercom. She also brings the subject any cumulative files or medical records requested from the office. The second experimenter serves as the Reference Memory.

During an in-basket administration the observers are not unlike the players in one-man bands. They have many roles to perform. A four-button keyboard for scoring behaviors is before them and is used to tally observational categories as they occur. In addition, one observer keeps a detailed log of all the things done by the subject in the order in which they occur.

All scores for which a button is pushed feed into an automatic printer-counter which sums scores within categories and prints out totals every sixty seconds. We thus have a permanent minute-by-minute record of the rate at which materials are attended to and problems are sensed.

Five basic scores and a summary score constitute the principal variables for analysis of in-basket performance.

Problem Sensitivity is the number of embedded potential problems reacted to as problems by the subject in the course of an in-basket situation.

Scoring for problem sensitivity is based upon a listing of potential problems embedded in the in-basket materials which was collected in an Examiner's Manual. Part of one of the manuals is reproduced as Appendix B. Manual development continued during Year One, but was stabilized by the beginning of Year Two. Whenever a subject's behavior (either verbal, physical or both) suggests that one of the embedded potential problems has been sensed, he is given a point for having sensed that problem. At that moment, the button for problem sensing is pushed and the sensing of a single problem is recorded.

For example, in the cardex for Catherine Serota, a sixth-grade student, the inquirer may note that she is reading at a grade level of 4.3, considerably below average. This is an embedded potential problem. Some subjects may not sense it as a problem. Others may read that score and whistle, say "oh-oh," shake their heads or even exclaim directly "That girl has a problem!" Any of these would be scored as one problem sensed by that subject. The problem's code number in this case would be A:XIII, 2b. (See Appendix for excerpt from Examiner's Manual of potentially problematic elements.)

If the subject continues to search for data about Catherine Serota on her report card or in her cumulative folder he is likely to sense more problems. He will discover that her most recently tested I.Q. was 139. Here the observer must judge whether the subject senses that this is an extremely high intelligence quotient (Problem A:XIII, 2a). Even if this is sensed the further problem, that Catherine's achievement and I.Q. are grossly out of line, may not be sensed. We have observed many subjects who sense each of the individual problems but fail to juxtapose them to identify the more deeply embedded problem of severe underachievement in this case (A:XIII, 2d).

After the completion of an inbasket administration the observers review the printed tape on which the problems sensed were tallied and compare the tape to the detailed log. The final problem sensitivity score is based upon that reanalysis. Earlier reliability studies of the problem sensitivity variable established its inter-rater reliability at between .80 and .90 after careful observer training.

We have experimented with a number of ways of scoring for problem sensitivity through weighting more heavily the scores for certain deeply embedded problems sensed. We have thus far not found a system of scoring that does not correlate very highly with the simple raw tally of total number of problems sensed. More subtle scoring procedures have not therefore been warranted by our experiences to date. A sample of the kind of log actually taken is reproduced in Chapter VI.

Time is the number of minutes the subject chooses to spend in the inquiry situation. As no time limit is set and no specific task instructions are given, each subject can determine for herself when she has finished.

Materials Attended, or *bits* is a measure of input, the number of pieces of material to which the subject attends in the inquiry period, representing the number of "bits" processed by the subject. The bits, or materials attended, button is pushed whenever the subject attends to a piece of stimulus material before him or shifts attention to an additional piece of material. Bits is seen as a fairly gross index of the number of separate acts of attention to stimulus materials by the subject. A bit can be scored for attention to any single piece of material (e.g., a particular child's report card) as many times as a discrete act of attention is observed.

An act of attention is a difficult judgment to make. It must be made on the spot, since the written log cannot be depended upon to record every bit. Consequently, the inter-rater reliability of this score varies between .70 and .80.

Information Sources is a count of the number of *kinds* or *categories* of information brought to bear by the subject on ten selected problems in the in-basket situation. As different information sources are used (e.g., report cards, cumulative folders, anecdotes, etc.), these are tallied on an Information Sources record sheet (see Appendix B).

To illustrate the difference between bits and information sources as scoring categories, let us review a few minutes of inquiry by a hypothetical subject dealing with the problem of Catherine Serota.

Our inquirer looks at Catherine's cardex, then reads her report card, returns to her cardex, glances at the class sociogram and once again studies the cardex. For that series of behaviors he has been scored for five bits, but only three sources. Unlike a bit, score for a source on a particular problem can be given only once, no matter how often it is revisited. This is also true of problem sensitivity.

Information sources is scored within the context of ten general problems. Problems of scoring reliability arise when the observer must judge whether a particular source has been employed in the service of problem-solving (for which credit is due) or has merely been passed over as part of a general survey of materials (which should not be scored). Because of this difficulty the inter-rater reliability of information sources is about that of bits, in the range of .70 - .80. This score is also rechecked against the log after the conclusion of an in-basket session.

Competence is a measure of problem resolution. It is a judgment, based upon the log and the subject's own notes, of how well each subject *comes to understand* the nature of the problem situation in the same ten selected problems used to score for information sources. The judgment was made by someone other than the original observer.

Scoring for competence was a two-stage process. First, the original observer studied the log and wrote out the solutions to each problem generated by the subject, removing the resolution from the context of the rest of the inquiry. Second, another judge rated these solution reports on a series of five-point competence scales, every point of which was specifically tied to a level of resolution adequacy. Appendix B reproduces the Competence scales for the two forms of the in-basket. Total scores for competence were based upon *squaring* the score for each competence item and summing those squares. This procedure was adopted because it was judged that a single level 4 resolution was reflective of substantially greater effort and insight than two level 2 resolutions.

The inter-rater reliability of competence was quite high because of the very explicit nature of each step of the competence scales. This reliability was in the range of .85 - .95.

Finally, a single summary score was generated to reflect overall inquiry effectiveness. This *general inquiry* score was developed as the sum of the standardized problem sensitivity, information sources and competence scores. These three scores were standardized (within forms of the in-basket) with a mean of fifty and a standard deviation of ten. Those standard scores were then summed to form the general inquiry score.

It may be noted that these variables are derived from our model of inquiry and attempt to assess the relevant dimensions of that process. Whereas the scores used by Hemphill, et al (1962) are rooted in a model of administrative decision-making, our variables are not domain-specific, even though the in-basket is a set of teaching problems. Our objective in this research is not to describe teaching behavior, but rather inquiry behavior. Teaching is here seen as a kind of inquiry.

In summary, scores on the in-basket variables are the result of both an ongoing series of judgments made by trained observers and a subsequent rechecking based upon the log or narrative account of the inquiry session taken down on the spot. Observers were trained using videotapes of in-basket sessions to increase inter-rater reliabilities. After establishing reliability at desired levels, videotape practice sessions were repeated at approximately three-month intervals for the remaining period of the study.

Design of the Present Research

The present research can best be thought of as comprising two distinct phases. The first phase, encompassing the period of September 1966 through August 1967 was highly exploratory. Many in-baskets were administered in an attempt to identify the stability and the reliability of the in-basket measures as well as to survey a wide variety of individual and group tests as they might relate to aspects of the inquiry process. The second phase of the research, from September 1967 to the conclusion of the study involved the systematic investigation of the effects of specific determinants of inquiry on inquiry performance as well as studying the impact of an intervening student teaching experience upon the manifest inquiry behavior of a sample of teachers-in-training.

Phase One

At the beginning of the first phase of this research only one form of the in-basket existed. This was the form originally used in earlier research reported by Shulman (1965). One of the major procedural problems that characterized this form of the in-basket was that it appeared to be too long and cumbersome. Twenty-four children were in the simulated classroom and the in-basket itself was quite full. This had two consequences. First, the overall amount of time required to deal with the contents of the in-basket at even the most superficial level was quite great. Second, an inordinately long period of time at the inception of the in-basket session was spent by the subject in general orientation leaving proportionally less time for the more problem-centered phases of inquiry.

At the beginning of this first phase of the research, our goal was thus to develop two shorter alternate forms of the teacher's in-basket which would be suitable for examining both the stability of inquiry behavior and its modifiability over time. The already existing in-basket was used as the nucleus for In-basket A although it was pared to 15 students and a somewhat abbreviated collection of in-basket materials. The second in-basket, In-basket B, was developed as an entirely new set of materials using those already in In-basket A as general models. This was not without problems since we wished the two forms of the in-basket to be sufficiently similar so that the same underlying processes could be manifested and observed in the two settings, yet not so similar that there would be a transfer of learning between the two in-baskets. Obviously any attempt to achieve the former goal would necessarily result in some problems relating to transfer of learning, but we hoped that this specific learning transfer could be minimized. The contents of In-basket A have already been summarized in Table 1. The contents of In-basket B can be found in Appendix A.

Having developed the two alternate forms of the in-basket, our next objective was double-barreled. We first wished to ascertain the degree of reliability between the two forms of the in-basket as well as to make an initial attempt at identifying the patterns of relations among the in-basket variables as well as between those variables and a host of other cognitive, attitudinal, personality and decision-making variables which could be measured outside the in-basket situation itself. In order to do this 30 female undergraduate education majors were randomly selected from among those studying the elementary methods courses at Michigan State University. (All elementary methods courses are taken as a block during a single quarter by elementary school teachers-in-training who most generally student teach during the following quarter.) Each of these 30 subjects was then administered nine hours of group testing, one hour of individual testing and the two forms of the in-basket. The list of group administered and individually administered tests is reported in Table 2. A more detailed description of each of these instruments is available in French (1963). The two inbasket forms were administered on the average about four weeks apart. The order in which the two forms were administered was counterbalanced to control for any consistent order effects.

At the end of the Winter Quarter we felt that we required more experience with each in-basket than the 30 administrations of each we had completed, and therefore planned to administer an additional 45 in-baskets, roughly divided between the two forms, during the ensuing six months. This was accomplished without difficulty. During that ensuing period a shortened form of the group testing was also administered.

At the end of the first year of the research we came to recognize some serious problems. Standardizing the two in-basket forms had been more difficult than we had anticipated. The same held true for staff training in administration and scoring of in-baskets. Most of the predictor tests employed in the test battery had failed to correlate with inquiry performance in the anticipated manner. There were very few substantial prediction findings to cross validate.

A number of the reasons for these problems will be discussed in Chapter IV. We came to view Phase One of the study as a general shakedown for and prolegomenon to Phase Two. With the experiences of the first year behind us, we learned to deal with the difficult problems of inquiry research and to cope with them successfully.

TABLE 2

TESTS USED IN YEAR ONE OF THE STUDY

A. Intellectual Performance [from French's *Kit of Reference Tests for Cognitive Factors* (French, *et al*, 1963)]

1. First and Last Names
2. Picture - Gestalt
3. Mathematical Aptitude
4. Inferences
5. Seeing Deficiencies
6. Picture - Number
7. Objective - Number
8. Finding A's
9. Number Comprehension
10. Maze Tracing
11. Figure Classification
12. Concealed Words
13. Advanced Vocabulary
14. Associations IV
15. Gestalt Completion

B. Other Cognitive Measures

1. Word Association
2. Closure Flexibility
3. MSU Reading Test
4. College Qualification Test
5. Cumulative Grade-Point Average
6. Matching Familiar Figures (Reflection-Impulsivity)

C. Attitudes, Values and Personality

1. Rokeach Dogmatism Scale
2. Inventory of Beliefs
3. D-V Inventory
4. Test Anxiety
5. Defensiveness
6. Eysenck Extraversion Scale
7. Eysenck Neuroticism Scale
8. Syllogism-Risk Test

Phase Two

The second phase of the study began with the identification of a revised battery of predictor instruments to be administered to all those subjects participating in the research. This list of instruments is reproduced as Table 3. Detailed analysis of these instruments and their contents can be found in Appendix C. The program of research began with a call for volunteers from among the approximately 180 participants in the elementary methods block of courses who met the criteria for the research population. These criteria were that (a) the subject be female, (b) majoring in elementary education (contrasted with junior high, special education or secondary education), (c) preparing to student teach during the subsequent Winter Quarter and (d) returning to campus for the Spring Quarter. Of the 180 who were eligible, 113 appeared for a three hour period of group testing which began at 8:00 in the morning.

The results of the group testing were taken and analyzed in the following manner: With the objective of maximizing the variability of characteristics represented in the sample, six of the variables taken from the initial testing were transformed into scaled scores and summed together. These variables included Complexity, Word Association, Risk Taking, Inventory of Beliefs, Closure Flexibility, and Lecture-Discussion.

These six variables were selected because they represented dimensions which our theory of inquiry would predict are highly relevant to inquiry performance and which had worked effectively in studies conducted by others. They should therefore measure attributes underlying the dialectical-didactic seeking dimension. The Complexity Scale measures the individual's reactions to the ambiguous, unpredictable and assymetrical. Barron (1967) had used it to distinguish between creative and non-creative individuals in such fields as architecture. The Inventory of Beliefs and Closure Flexibility instruments were used in the studies of Stern, Stein and Bloom (1956) and Witkin (1954) cited earlier. Word Association was a test of verbal flexibility used by Getzels and Jackson (1962).

Two instruments were developed specifically for this research. The Risk-taking test, Syllogism-Risk, measured the willingness of subjects

TABLE 3

LIST AND BRIEF EXPLANATION OF INSTRUMENTS USED IN GROUP TESTING OF SUBJECTS IN YEAR TWO

Instrument	What It Measures
Closure Flexibility	Field Independence
Inventory of Beliefs	Non-Stereopathy
Complexity Scale	Cognitive Complexity
Education Scale	Student or Subject Matter centered attitude
Lecture-Discussion Scale	Preference for lectures or discussions
Focus-Scan Scale	Reported tendency to focus or scan when reading school related materials
Biographical Inventory	Social Class, Rural-Urban, Political Preferences, Study Habits, Teaching Plans and Anxieties
Syllogism-Risk Test	Willingness to take risks on test of logical reasoning
Test Anxiety Scale	Reported anxiety in test situations
Defensiveness Scale	Tendency to give socially desirable responses to scale items
Word Association	Verbal Associational Fluency; Creativity
The Following Tests Were Administered to the Students as Entering Freshmen and Were Available From Their Records	
College Qualification Test (CQT)	General aptitude battery with Verbal, Numerical, Information and Total Scores
M.S.U. Reading Test	Ability to comprehend, interpret, analyze and make inferences about passages on political, scientific and other topics
M.S.U. English Test	Test of general English grammar and usage

to place real money bets on their answers to very difficult syllogism items taken under extreme time pressure. The Lecture-Discussion scale measured the relative perferences of subjects for lecture versus discussion-type learning experiences.

It was hypothesized that any individual scoring at or above the median on all six variables would surely qualify as a *dialectical type;* all those scoring consistently at or below the median on all six would warrant the prediction that they were *didactic types.* By blocking on cumulative grade-point average (GPA) we hoped to separate the effects of seeking predisposition from those of general academic competence and thus measure the relative salience of those two kinds of characteristics for the inquiry performances of subjects.

The scores were standardized so that higher scores reflected the dialectical model of high complexity, many word associations, high risk taking, high non-stereopathy, high field independence, and preference for discussions over lectures in teaching. The distribution of standard scores was then divided at the median as was the distribution of college grade point averages for the same subjects. Our goal was to establish groups of subject types who were, respectively, high on both grade point average and the predictor variables, low on both these dimensions, and two groups for which the dimensions were incongruent. Fifty-one subjects who were consistently above or below the median on all six variables were selected. (See Table 4.) An additional ten subjects were selected because they manifested a rather interesting pattern of scores within the predictor variables. A total of 61 subjects was thus invited to participate out of the 113 who had taken the total battery of tests. All 61 agreed to participate. During the reminder of that quarter the 61 participants were each observed during the administration of one of the forms of the in-basket (with order again counterbalanced) as well as receiving the battery of individually administered tests which is reproduced in Table 5. All subjects completed all of the scheduled testing within the Fall Quarter of 1966.

During the Winter of 1967, all 61 subjects were assigned to student teaching experiences throughout the State of Michigan. It

TABLE 4

BREAKDOWN OF YEAR TWO SAMPLE BY SEEKING PREDISPOSITION AND GRADE-POINT AVERAGE*

		Seeking Predisposition		
		Dialectical	Didactic	
GPA	High (>2.50)	13	12	25
	Low (<2.50)	12	14	26
		25	26	51

*An additional ten subjects who did not fall into any of the above four cells also participated in the study and were referred to as "pattern subjects." The total Year Two sample was then 61.

was thus physically impossible to attempt to observe each of our subjects in her student teaching role. Instead, we determined to gather data which would assess the characteristics of the supervising teachers to which each of our student teachers were assigned. A subset of the instruments used to select the student teacher was thus prepared for administration to each of the participating supervising teachers. Forty-seven of the sixty-one participating supervising teachers responded to the request for testing positively and submitted their tests to us by mail. The subset of the testing battery used for this additional testing is reported in Chapter VII. Chapter VII will examine the data from the intervening student-teaching experience and its effects on subsequent inquiry behavior.

In the Spring Quarter of 1967, when all the girls returned to campus, each was administered an alternate form of the inbasket. Following each inbasket each subject participated in a detailed interview as well as a short recall test based upon the contents of the inbasket

TABLE 5

INDIVIDUAL TEST BATTERY FOR YEAR TWO

Test	What It Measures
Rorschach's Test (Cards 1,2,7 & 10)	The Rorschach is used here as a measure of subject's response to an ambiguous stimulus requiring an unambiguous organized response. Four of the full set of ten blots are employed, two (1&7) are black and two (2&10) involve color. Responses are scored using Beck's categories.
Matching Familiar Figures	MFF measures the time taken and the accuracy with which a person can match a model figure to its replicate when the replicate is imbedded in a set of six variants. It is interpreted as measuring judgmental ability in the face of stimulus uncertainty, or conceptual tempo.
Wechsler Block Design Test	Block design measures the ability of a person to reproduce a visual model using blocks on which geometric patterns are painted.
Stroop Color-Word Test	Stroop measures the speed with which one can read the names of colors printed in conflicting colored ink, eg., *red* printed in green ink. The score used in this report is a measure of the subject's ability to perform in a situation of perceptual conflict, ie., a measure of susceptibility to perceptual interference.

which they had just worked through. This completed the data gathering for the second phase of the research.

Strategy of Data Analysis

In order to meet the objectives of the present investigation, the following strategy of data analysis was evolved. During Year One, techniques of in-basket administration and scoring were to be refined and standardized. Correlations between the large number of predictor variables and inquiry criterion scores were to be used to select a much smaller group of inquiry predictors, as well as to identify a basis for selecting Year Two subjects.

In Year Two the two-way factorial method of subject selection was to be evaluated by factorial analyses-of-variance with personality pattern and grade-point average as independent variable factors and the inquiry criterion scores as dependent variables. This was to be followed by correlational and multiple regression analyses to identify the most effective predictors of inquiry performance.

The nature of the inquiry process itself would be explored through examining intercorrelations among the inquiry variables as well as through examining sub-group changes over time. Finally, a series of sequential content analyses would be conducted to probe more deeply into the characteristic of inquiry performance.

CHAPTER IV

GENERAL FINDINGS: THE DETERMINANTS OF INQUIRY

This chapter will relate the basic findings of the present study. We shall begin with a brief review of the experiences of the first year of the research, which enlightened the investigators more than it illumined the problems. After describing some implications of the Year One data we will describe the Year Two results, comparing these with the first year findings when appropriate.

Results of Phase One

Whereas we had anticipated that Year One of this study would serve to establish a reliable set of interrelations between the determinants of inquiry and the parameters of that process, we instead experienced a year of frustration, frequent failures, unexpected problems and indispensible enlightenment. After spending the Autumn of 1965 in the creative activity of generating a new form of the in-basket to parallel the form that already existed, we found in employing it during the winter that it is not the same to strive for equivalence and to attain it. We found that much additional work was needed to establish truly parallel scoring categories across in-baskets that differed in content.

We also came to recognize that the same kinds of relations that were identified when subjects were selected because they fit into certain specified types were not necessarily replicable when subjects were randomly selected from a population that differed from the population in which earlier studies were conducted. This problem will be examined in detail in a later section of this chapter.

We also learned that training the staff to make reliable observations and judgments of very complex processes was a difficult task for which frequent practice and feedback was the only sure solution. A number of practice periods using video tapes of in-basket sessions to work on scoring reliability proved useful. In summary, far from using the first year of this study to build a detailed edifice which we could then duplicate in the second year, we found ourselves using that year to master the tools which we had so taken for granted.

Activities of Year One after the pre-post study centered on attempts to make the two forms of the in-basket more similar and further to refine and standardize techniques of scoring and log-recording. Forty-five additional in-baskets were administered during the Spring and Summer of 1966 to achieve the desired level of in-basket proficiency.

The results of the Year One research were not a total loss however. First, despite scoring difficulties, we were able to establish that most of our scoring categories retained respectable though moderate stabilities across four weeks and different forms of the in-basket. Table 6 reports those stability coefficients for Year One. Table 7 summarizes the names and definitions of the basic inquiry variables to assist the reader in interpreting the findings of this section.

We find that the amount of time which the subject chooses to spend in inquiry is the most stable variable with a correlation of .55 for two in-basket administrations across approximately a four-week period. Close behind the time variable are competerce and problem sensitivity with stability coefficients of .49 and .46 respectively. Although the information sources variable is unstable, the general inquiry score, which is a summation of problem sensitivity, information sources and competence, retained a stability of .48.

TABLE 6

STABILITY COEFFICIENTS FOR INQUIRY PROCESS VARIABLES BETWEEN ADMINISTRATION ONE AND TWO, YEAR ONE

(N=30)

Variable	Stability
Problem Sensitivity	.46
Information Sources	.21
Competence	.49
General Inquiry	.48
Bits	.36
Time	.55

Table 8 reports the means and standard deviations of the basic inquiry process scores for the four types of administration conditions used in Winter of Year One: Form A taken first, Form A taken second, Form B taken first, and Form B taken second. It is apparent that only in the case of problem sensitivity is there a clearly consistent difference among these which is attributable to form rather than administration. Thus it appears that the materials of and/or the manuals for scoring the two forms lead to more problems being sensed by those taking In-basket B than In-basket A. However, there is no difference in the number of problems sensed by those taking either in-basket first or second. Problem sensitivity is form-specific, not administration-specific.

For the Information Sources variable, all administrations seem identical except for Form A taken the first time, which exceeds the other three conditions by approximately one half a standard deviation. With respect to Bits, the effect seems clearly administration-specific and form-independent. That is, whether taking Form A or Form B of the in-basket, individuals will expend approximately the

TABLE 7

SUMMARY OF INQUIRY PROCESS VARIABLES AND THEIR SCORING

Variable	Scoring
Problem Sensitivity	The total number of embedded potentially problematic elements reacted to by the subject as problematic in the course of an inquiry session.
Information Sources	The average number of information sources (e.g., report card, cardex, medical record) employed by a subject on ten selected problems.
Materials Attended or Bits	The total number of discrete observable acts of attention to pieces of in-basket materials during the course of inquiry. Despite the similarity of terms, *the bits score bears no relation to information theory.*
Competence	The level of resolution depth or adequacy achieved by a subject on ten selected problems. Expressed as the sum across the ten problems.
Time	Total number of minutes spent in the in-basket situation.
General Inquiry	Summary score. The arithmetic sum of S's standardized scores ($\bar{x}=50$, $\sigma=10$) on Problem Sensitivity, Information Sources and Inquiry

TABLE 8

MEANS AND STANDARD DEVIATIONS FOR INQUIRY VARIABLES, YEAR I, CLASSIFIED BY FORM AND ADMINISTRATION

	Administration I			
	Form A		Form B	
	N=15		N=15	
Problems	Mean	51.67	Mean	67.20
	S.D.	18.57	S.D.	26.47
Information Sources	Mean	5.56	Mean	5.00
	S.D.	1.41	S.D.	1.73
Bits	Mean	227.27	Mean	224.27
	S.D.	57.06	S.D.	64.84
Time	Mean	116.73	Mean	115.86
	S.D.	21.50	S.D.	26.55
Competence	Mean	49.33	Mean	58.60
	S.D.	19.63	S.D.	31.37
	Administration II			
	Form A		Form B	
	N=15		N=15	
Problems	Mean	49.93	Mean	64.73
	S.D.	15.15	S.D.	19.43
Sources	Mean	5.10	Mean	4.87
	S.D.	1.25	S.D.	1.27
Bits	Mean	164.87	Mean	181.80
	S.D.	58.82	S.D.	53.68
Time	Mean	88.87	Mean	99.60
	S.D.	32.48	S.D.	17.35
Competence	Mean	47.93	Mean	59.93
	S.D.	28.94	S.D.	22.60

same number of bits on first administration. On second administration, no matter which in-basket they are using, they will expend far fewer bits. This difference in bits is clearly related to the amount of time they expend.

Independent of form, subjects expend identical amounts of time during their first administration of the in-basket and substantially less time on the second administration. Here it appears that, as was the trend with bits, there is a tendency for In-basket B to hold subjects for slightly more time than In-basket A.

Competence during Year One seems to behave in a manner much like problem sensitivity. From Administration I to Administration II, within in-basket forms, competence remains almost constant. The variation in competence over administrations is only about one and one half score units. Conversely, competence varies widely across in-basket forms. The mean competence scores on Form A of the in-basket are consistently lower than on Form B. Thus competence, like problem sensitivity, seems very form-specific and not greatly affected by any variables which intervene between administrations.

Thus, in spite of the repeated frustrations of data collection in Year One the stability and status analysis of the in-basket process variables was somewhat encouraging. The differences between in-basket forms, small though they generally were, led us to transform all inquiry scores to standard T-scores ($\bar{x}=50$, $\sigma=10$) *within form* for analyses involving comparisons of inquiry performance between administrations. Our assumptions were (1) that a particular raw score on a form of the in-basket represented the same level of performance whenever it was recorded and (2) that the two forms were measuring essentially the same processes and characteristics despite some slight differences in raw score means and standard deviations. Given these assumptions, the T-score transformation was clearly desirable.

All subsequent analyses reported in this chapter have been made on such transformed scores whenever all observations within a single administration of the in-basket are being discussed. The sole exception is *General Inquiry* which, it will be recalled, is the sum of the three T-scores for problem sensitivity, information sources and competence.

Having established the relative stabilities of the inquiry variables, we now turn to the correlations among those scores reported in Table 9.

TABLE 9

MATRIX OF INTERCORRELATIONS AMONG BASIC INQUIRY PROCESS VARIABLES FOR ADMINISTRATIONS ONE AND TWO[a], YEAR ONE (N=30)[b]

Problems						
Sources	*.29* .66					
Competence	*.75* .62	*.43* .51				
General Inquiry[c]	*.85* .88	*.70* .85	*.89* .84			
Bits	*.28* .39	*.41* .26	*.43* .09	*.46* .28		
Time	*.31* .18	*.46* .20	*.42* .23	*.49* .24	*.79* .58	
	Problems	Sources	Competence	General Inquiry	Bits	Time

---

[a] Administration One correlations are printed in *italics*; Administration Two are printed in normal type.

[b] For N=30, a correlation of .36 will occur by chance 5% of the time; a correlation of .42 will occur 1% of the time (two-tailed tests).

[c] Note that correlations of Problem Sensitivity, Information Sources or Competence with General Inquiry are of a part-whole nature. The high level of those three correlations is thus attributable to overlap.

We may observe that the correlations among the inquiry variables are generally moderate to high, reflecting the degree of statistical dependence expected by the theory, yet sufficient independence to warrant maintaining them as separate scores. Bits and Time are highly correlated for Administration I, less so in Administration II.

Apparently as subjects learn more about the in-basket situation, sheer amount of time spent becomes less critical and how that time is employed becomes more important. This is reflected in the lower correlations between the inquiry process variables and both bits and time on Administration II. At the same time, the correlations among the inquiry process variables themselves remain stable or rise between the two administrations.

It was in the quest for a set of variables that could be identified as determinants of inquiry that the Year One data were less helpful. Despite the large number of tests employed (See Table 2), there was a marked absence of any consistent predictive correlational pattern. Most of the correlation matrix generated by that study is reproduced in Appendix D.

A Note on Samples, Prediction and Generalizability

We suspect that the major reason for the failure of the predictor tests in Year One was the manner in which we selected our small samples. We had selected the thirty subjects who participated in the pre-post study of Winter 1966 randomly from those who were preparing to student teach. We found that although the stabilities of our data were quite respectable, as were the magnitudes of the intercorrelations among the inquiry variables, the relations of the inquiry process measures to those predictor variables that purported to act as the determinants of inquiry were very disappointing. This was in marked contrast to the very effective predictions made in the earlier research by Shulman (1965) using parallel and sometimes identical instruments. We came to recognize that it was likely that Shulman's findings, though appropriately gathered, had resulted in inappropriate inferences. It was conceivable that they had been successful because of the fact that the subjects had not been selected at random but rather had been selected to represent very clear types. That is, the theory of the determinants of inquiry that directs this research may only hold for those people who fall into certain fairly consistent categories. Individuals who do not fall into these categories may not be predictable given these criteria.

We therefore found ourselves designing for Year Two a research method that fell approximately midway between those methods used by two separate investigations of the relationship between creativity and intelligence, that of Getzels and Jackson (1962) and that of Wallach and Kogan (1965).

Getzels and Jackson tested over 600 children in order to identify those subjects who were in the top 20% on measures of creativity but not in the top 20% on measures of intelligence as well as those testing in the top 20% on intelligence but not on creativity. Because of the moderately high correlation between creativity and intelligence in their samples, they were able to identify only about 25 children in each of these two groups. They then proceeded to contrast these two groups of children in terms of a host of other psychological characteristics. Their selection of subjects clearly did not fall into what is traditionally considered 'sampling.' They worked only with students of a single school and then carefully selected only a small subset of these.

Beginning with a cogent critique of the work of Getzels and Jackson, Wallach and Kogan designed their own study of creativity and intelligence. Their criticism of the earlier studies focused upon a number of areas of which we shall only discuss one. They criticized Getzels and Jackson's approach to the selection of subjects on the grounds that they had erred in two ways. First, they should have studied not only those individuals who were high in one of the two characteristics and not in the other, but also those individuals who were high on both or low on both. Without these additional groups it was impossible to develop a complete description of the relationship between creativity and intelligence. Second, they should have used their entire sample instead of only the extremes. Wallach and Kogan then proceeded to conduct a study in which they used the entire 5th grade population of a single suburban school system to which they administered a large battery of intelligence and creativity tests. They then divided the array of scores on the creativity and the intelligence instruments each at the median thus constructing a four cell matrix of individuals who were either congruent or incongruent on the two measures in question, creativity and intelligence. Because the two types of measures were uncorrelated in their sample, they had approximately equal sample sizes in each of their four cells. They therefore maintained that by using all of their sample they could appropriately use statistical inference techniques which Getzels and Jackson had used inappropriately.

Both of these investigations have been criticized for making inappropriate inferences and for employing the statistical inference techniques in violation of their underlying assumptions. It would appear that the criticisms made of these studies are justified. In both cases the investigators were surely warranted in using statistical techniques to assist them in making precise descriptions of the groups they had formed. In neither case were they warranted inferences to populations that could be labeled "creative youngsters" or "intelligent youngsters" or similar general categories. In neither case had they truly sampled from the population of the youngsters so classified in a way that gave all members of the population an equal opportunity to be selected as part of the sample.

All this discussion is simply a prologue to our recognition in this study that we cannot appropriately make inferences from our data to the population of inquirers-at-large or even to the population of pre- and post-student teaching female elementary education majors. The most appropriately conservative statement is that these inferences are considered descriptions of the inquiry characteristics of four groups selected because they were systematically consistent or inconsistent in the combination of traits denoted by the terms dialectical-high grade point average, etc. We believe that we can generalize from the groups so selected to that population of groups which might be selected in a similar manner. However, we must recognize that the statistical model of analysis of variance which we employ in this research cannot technically be used with our present sampling procedures to generate statistical inferences of that kind.

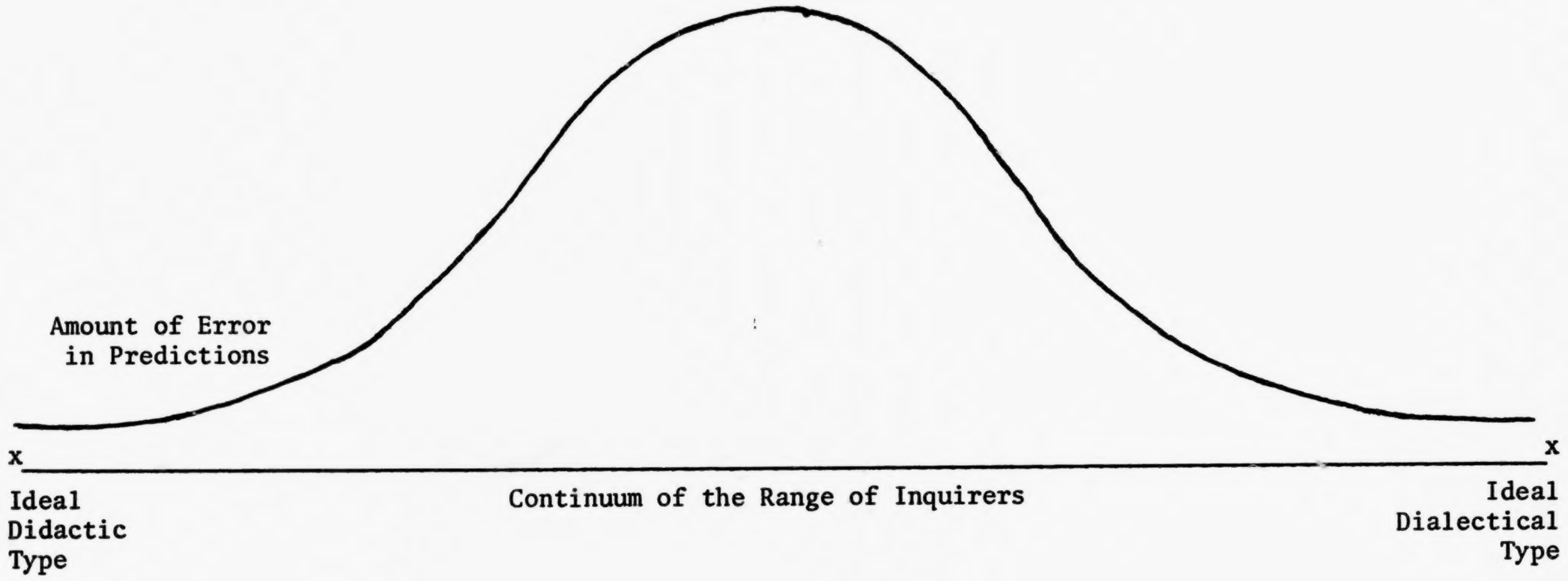
We would therefore maintain that the results of the present study can at best be generalized only to that population of individuals who can be identified as fundamentally dialectical or fundamentally didactic in the pattern of personality, attitudinal and cognitive style attributes we have identified in this research. That proportion of the general population which cannot be typed with this consistency apparently does not follow the general patterns we have described. Apparently as individuals get farther from the ends of such a continuum, other factors not tapped by the instruments we are using become more influential for their behavior and make their behavior less predictable on the basis of the determinants we employ (See Figure 2). It may therefore be inappropriate to speak of an underlying continuum in this case. Although the scores can be continuously arrayed, only the discrete categories at each end may carry psychological meaning.

Phase Two of the Study

Although the Year One results did not provide many clearcut relationships for replication between determinants and inquiry process variables, we had learned much concerning the administration and standardization of the in-baskets. We had clearly identified variables that did *not* predict inquiry performance, as well as those conditions which seemed to detract from the reliability of the processes examined. Therefore, by combining previous experience with the inquiry situation (Shulman, 1965) and the results gathered in Year One, the design for Year Two was carried out.

FIGURE 2

THE THEORETICAL RELATIONSHIP OF APPROXIMATION TO AN IDEAL POLAR TYPE (DIALECTICAL OR DIDACTIC) AND THE AMOUNT OF ERROR VARIANCE IN PREDICTIONS MADE OF INQUIRY PERFORMANCE



Attrition

In a study involving college students for a full academic year a certain amount of attrition would seem inevitable. In this investigation we found ourselves remarkably fortunate in the relatively light attrition which we suffered. It will be recalled that 61 subjects who had been selected for participation in the study finished the Fall Quarter of 1966 in Year Two. During the Winter Quarter student teaching experience, two subjects dropped out of school for personal reasons and were thus disqualified from further participation. In the Spring Quarter when the subjects returned to campus, three additional subjects refused to participate in the final stages of the study because of problems in preparing for their impending graduations. We thus suffered an attrition of five subjects from a total entering sample of 61, an attrition rate of approximately 8%.

For reasons of expedient data analysis we have included the data on members of the attrition group in reporting means and standard deviations for the inquiry process variables as measured during the pre-student teaching phase of Year Two. All other analyses are conducted using only those subjects who completed the entire study.

Unfortunately the attrition did not affect all groups equally. Three of the five subjects who failed to complete the study were from the dialectical-low GPA group. This was an unfortunate but unavoidable exigency. Although we considered using multiple regression to estimate the post-student teaching scores of the drop-outs, we decided that this would not be a thoroughly defensible tactic. Analyses are thus conducted using samples of 56 subjects, which includes the ten "pattern subjects" who were selected in addition to those 46 fitting into the 2 x 2 design. Table 10 reports the breakdown of the dialectical and didactic group subjects after attrition.

Status and Stability

Table 11 reports the means and standard deviations of the five basic inquiry variables for the two in-basket administrations of

TABLE 10

BREAKDOWN OF SUBJECTS REMAINING AFTER ATTRITION FOR YEAR TWO STUDY*

		Seeking Predisposition		
		Dialectical	Didactic	
GPA	High	N=12	N=12	24
	Low	N=9	N=13	22
		21	25	46

*An additional ten "Pattern" subjects remained for the entire duration of the Year Two study. The total sample was thus 56.

Year Two. In Year Two the scores for problem sensitivity are much closer between the two in-basket forms, yet remain slightly form-specific. Bits and Time are both clearly administration specific and independent of form. Information sources fluctuate very little across forms, while competence appears to vary as a function of both form and administration for Form A, while remaining stable on Form B. As explained earlier, T-score transformations were used to equate the meaning of scores.

In order to facilitate comparisons of mean scores both within and between years, Figures 3-7 are provided. These figures summarize the relations between administration and form for each of the five inquiry variables in each year of the study.

TABLE 11

MEANS AND STANDARD DEVIATIONS FOR INQUIRY VARIABLES, YEAR II, CLASSIFIED BY FORM AND ADMINISTRATION

Administration I

	Form A		Form B	
	N=30		N=31	
Problems	Mean	63.57	Mean	67.81
	S.D.	15.02	S.D.	17.48
Sources	Mean	5.49	Mean	5.84
	S.D.	1.01	S.D.	1.09
Bits	Mean	216.70	Mean	215.42
	S.D.	61.49	S.D.	48.16
Time	Mean	124.83	Mean	120.0
	S.D.	28.06	S.D.	20.37
Competence	Mean	72.79	Mean	65.46
	S.D.	31.06	S.D.	20.43

Administration II

	Form A		Form B	
	N=28		N=28	
Problems	Mean	63.71	Mean	69.36
	S.D.	20.23	S.D.	18.65
Sources	Mean	5.7	Mean	5.32
	S.D.	1.3	S.D.	.75
Bits	Mean	167.57	Mean	172.46
	S.D.	66.65	S.D.	54.16
Time	Mean	99.57	Mean	109.39
	S.D.	26.83	S.D.	27.78
Competence	Mean	61.79	Mean	69.61
	S.D.	29.85	S.D.	26.78

FIGURE 3

MEAN PROBLEMS SENSED FOR FORMS A AND B,
FIRST AND SECOND ADMINISTRATIONS,
YEAR 1 AND YEAR 2

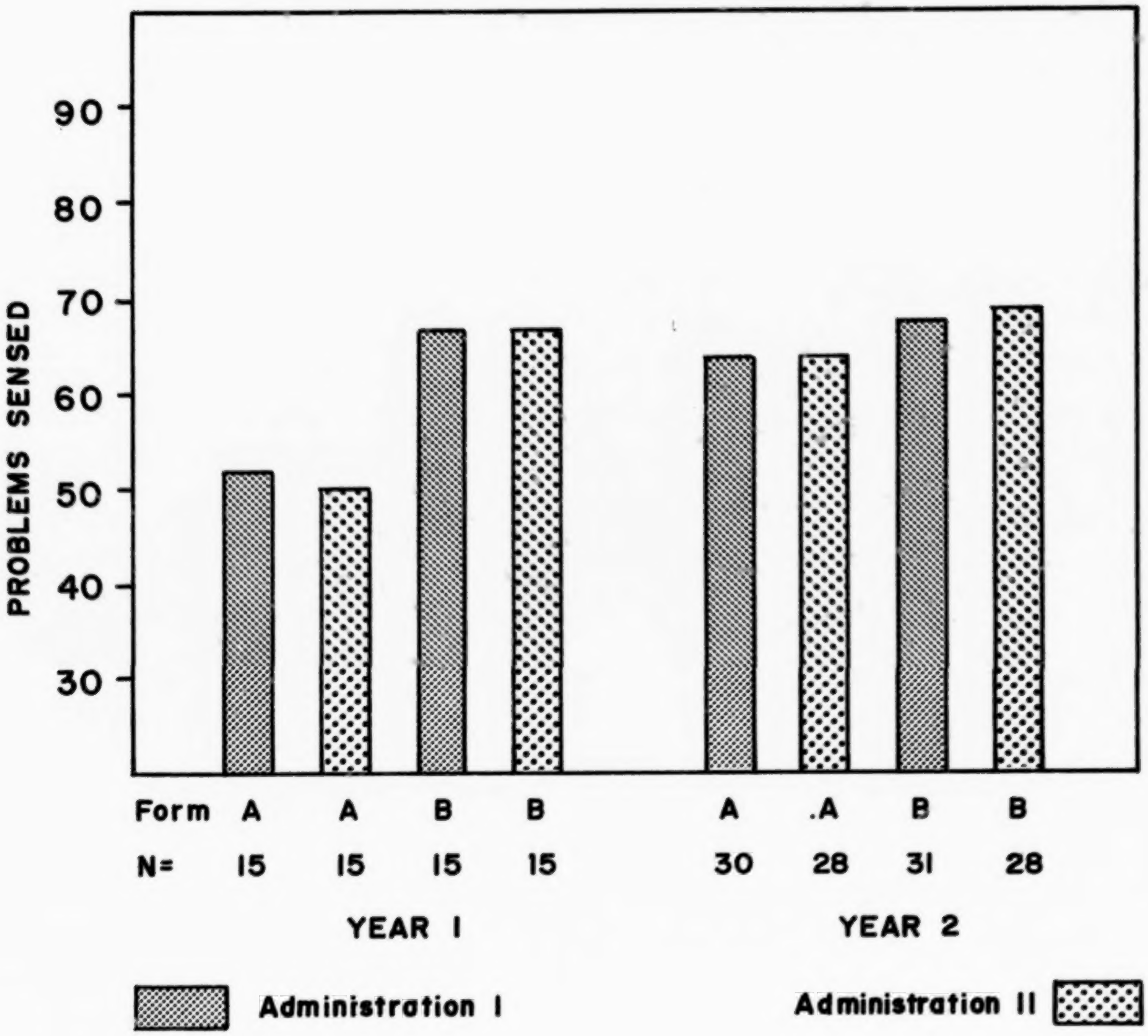


FIGURE 4

MEAN SOURCES FOR FORMS A AND B,
FIRST AND SECOND ADMINISTRATIONS,
YEARS I AND 2

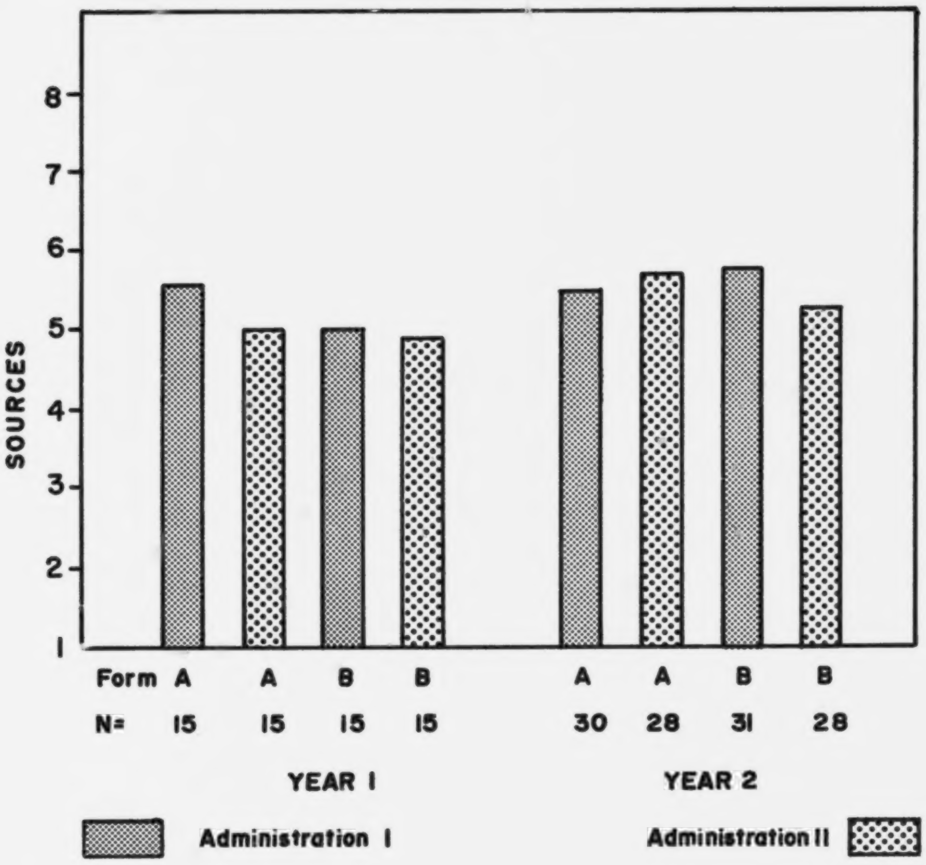


FIGURE 5

MEAN COMPETENCE FOR FORMS A AND B,
FIRST AND SECOND ADMINISTRATIONS,
YEARS I AND 2

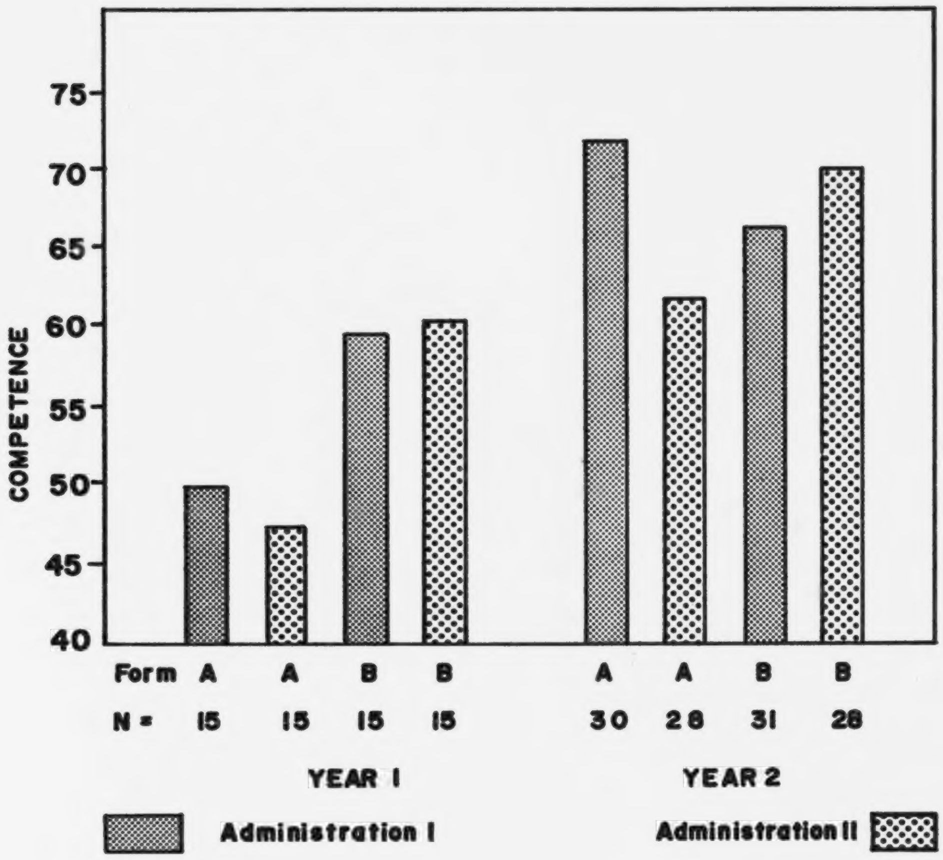


FIGURE 6

MEAN TIME FOR FORMS A AND B, FIRST AND SECOND ADMINISTRATIONS, YEARS I AND 2

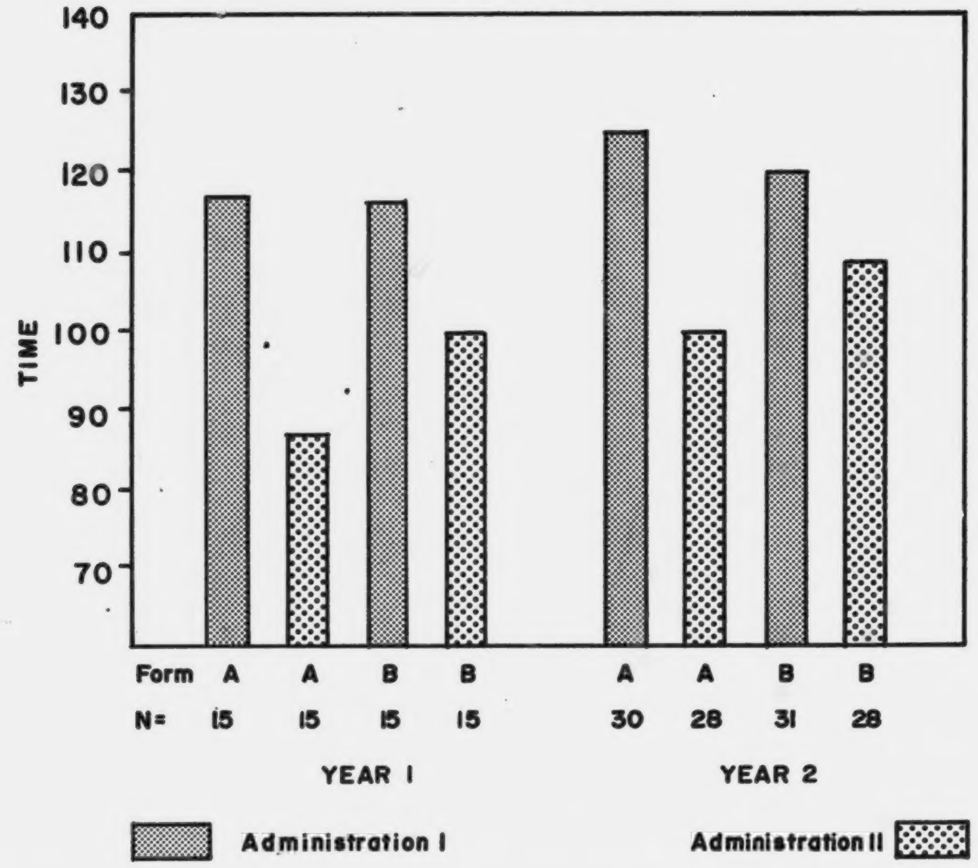
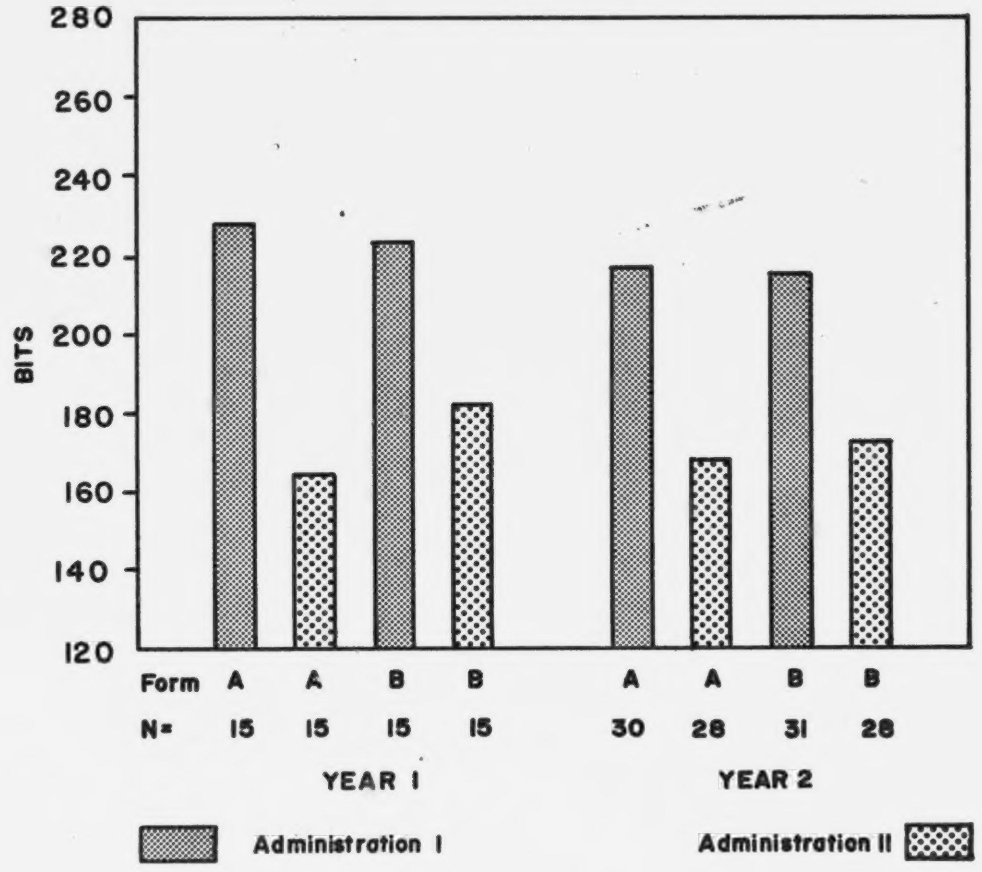


FIGURE 7

MEAN BITS FOR FORMS A AND B, FIRST AND SECOND ADMINISTRATIONS, YEARS I AND 2



Stability of In-Basket Scores

We turn now to the stability of the scores on the in-basket. It will be recalled that in Year Two a period of up to 7 months elapsed between the first and second in-basket administration for most subjects, during which they completed their educational methods training, completed a student teaching term, and began a course in the social and philosophical foundations of education. It was anticipated that important changes might take place as a function of these experiences and that the changes would not be uniform for all students. We therefore expected that the size of stability coefficients would not be as high during Year Two as they had been in Year One, even assuming a higher degree of scoring reliability during Year Two. There is a substantial difference between an intervening period of four weeks and one of seven months, especially when the period of seven months includes potentially pivotal experiences in the development of one's attitudes and skills as a teacher.

Table 12 summarizes the stability coefficients between the first and second administrations of the in-basket. It can be noted that stabilities vary as a function of the reliability of the individual measures as well as their expected modifiability over time. Thus, we generally recognize that bits is our least reliable measure, whereas time is the most reliable. These differing reliabilities are reflected in the magnitude of the stability coefficients. The low stability of information sources is not likely to be a function of its reliability, which is high. Instead, we may attribute its low stability to the very small standard deviations for those scores. We must also recognize that changes were anticipated between Fall and Spring as a function of the intervening student-teaching experience. This too would severely limit the stability of the scores.

TABLE 12

STABILITY COEFFICIENTS FOR INQUIRY PROCESS VARIABLES BETWEEN ADMINISTRATION ONE AND TWO, YEAR TWO

(N=56)

Variable	Stability
Problem Sensitivity	.41
Information Sources	.21
Competence	.35
General Inquiry	.36
Bits	.26
Time	.42

For N=56, the probability of a correlation of .22 occurring by chance is $\leq .05$; the probability of a correlation of .31 is $\leq .01$. (one-tailed tests)

Relations Among Inquiry Variables

Examination of the intercorrelations among the inquiry process variables themselves in Table 13 again reflects the dependence among those variables that was theoretically posited. We find that the two variables which one might think ought to be very highly correlated, bits and time, correlate .42 and .40. There is no necessary relationship between the amount of time an individual spends working on the in-basket and the number of bits to which he attends. There is a general moderate relationship between them but they are far from isomorphic. The generally highest correlations are among the three basic inquiry criterion variables--competence, problem sensitivity, and sources, whose intercorrelations average about .60 on first administration and .70 on second administration. The higher correlations are between problem sensitivity and competence and problem sensitivity and sources. The correlation between sources and competence is somewhat lower. However, with more than 50% of the variance in each variable not accounted for by either of the others, there is very good reason to examine them quite independently as well as jointly in the General Inquiry variable. As in Year One, correlations among inquiry process variables tend to rise between the first and second administration.

TABLE 13

MATRIX OF INTERCORRELATIONS AMONG BASIC INQUIRY PROCESS VARIABLES FOR ADMINISTRATIONS ONE AND TWO[a], YEAR TWO (N=56)[b]

	Problems	Sources	Competence	General Inquiry	Bits	Time
Problems						
Sources	*.68* .81					
Competence	*.59* .75	*.56* .56				
General Inquiry[c]	*.87* .95	*.83* .88	*.83* .86			
Bits	*.46* .49	*.48* .54	*.39* .24	*.51* .47		
Time	*.68* .77	*.34* .62	*.31* .65	*.43* .76	*.50* .42	

---

[a] Administration One correlations are printed in *italics*; Administration Two are printed in normal type.

[b] For N=56, the probability of a correlation of .22 occurring by chance is $\leq .05$; the probability of a correlation of .31 is $\leq .01$. (one-tailed tests)

[c] Note that correlations of Problem Sensitivity, Information Sources or Competence with General Inquiry are of a part-whole nature. The high level of those three correlations is thus attributable to overlap.

Seeking Predisposition, Academic Achievement and Inquiry Performance

The first purpose of the Year Two research was to examine the predictability of inquiry behavior as a function of grade point average and seeking predisposition respectively. It will be recalled that subjects participating in the Year Two study were selected on the basis of their scores on a single composite measure which reflected their position on six predictor variables: Closure flexibility, nonstereopathy, preference for discussions over lectures, complexity, fluency in word associations, and willingness to risk. Subjects consistently high on these variables were termed the dialectical group and subjects low on those variables were denoted the didactic group. Members of each of these groups who were both high and low in grade point average (GPA) were selected. The two by two breakdown reflected in Table 10 was thus created.

We will examine scores on the inquiry process variables in terms of the seeking style by grade point average grouping. Our general anticipation was that seeking predisposition would serve as a far more important factor in inquiry behavior than academic achievement despite the academic community's reliance upon GPA as the *sine qua non* of scholarly accomplishment. We will examine these findings in the light of a series of paired two-way factorial analyses of variance where the influence of seeking predisposition and grade point average is compared. The unequal numbers of subjects in the four cells made it extremely difficult to conduct a single three-way repeated measures analysis in each instance. Cell sizes were too small to consider a random throw-out procedure to equalize sample sizes. We therefore concluded that pairs of two-way factorial analyses were our most feasible alternative.

The analysis of variance tables will include most of the kinds of information usually expected in such tables: Source of variation, degrees of freedom, mean square, value of the F statistic, and the exact probability of that value of F occurring by chance. One additional piece of information is included in our tables: R^2 full and R^2 restricted.

The R^2 full, indicated at the bottom of each table, is the proportion of variance accounted for by all three sources of systematic variation in the analysis: Seeking predisposition, GPA and their interaction. The R^2 restricted, which is printed after the value for each source, is the amount of variation for which we could account if we had no knowledge (hence, a restriction of knowledge) of scores for that source. R^2 here represents the squared multiple correlation between that array of scores we would generate as our prediction of the criterion variable ($\hat{Y}$) and the actual scores of subjects on that criterion (Y).

For example, let us look at Table 14. For Administration II we see that the R^2 full is .18. That is, when we use all the information given by seeking style category (high-low), grade point average (high-low) and their interaction, we have accounted for 18% of the variance in the actual problem sensitivity scores of our subjects. When we restrict our knowledge of seeking style, and look at the R^2 restricted which remains, we find we have reduced our accountable variance to .02. Conversely, when we restrict on GPA, we only drop to an R^2 restricted of .17 from the R^2 full of .18. Hence, the GPA source has little valuable information to bring us regarding problem sensitivity.

A fuller explanation of the use of R^2 in such an analysis can be found in Bottenberg and Ward (1960). They have demonstrated that the R^2 term in this analysis is mathematically equivalent to Ω^2 (Omega squared) as discussed by Hayes (1963).[1] We believe that by providing these values in our tables we may add to the useful information which they convey about the data.

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[1] The value of F for any comparison can be calculated from the following formula involving the R^2 statistic:

$$F = \frac{R^2 \text{ Full} - R^2 \text{ Restricted}/df_1}{1 - R^2 \text{ Restricted}/df_2}$$

See Bottenberg and Ward (1960) for the derivation.

Figure 8 and Table 14 summarize the findings for the problem sensitivity variable. Note that in order to equate for scoring differences between forms, all scores were converted to standard T-scores with a mean of 50 and a standard deviation of 10 based on within form distributions. It is apparent that on the problem sensitivity variable both groups which are dialectical in seeking predisposition are above both groups which are didactic on that measure irrespective of grade point average. However, it can also be seen that in general the groups distribute in line with their grade point averages within seeking style subgroups. The analysis of variance confirms these results. The seeking style factor accounts in a highly significant manner for the variation in problem sensitivity during both in-basket administrations. Neither the GPA factor nor any of the interactions account for relevant amounts of variation. We thus can say with no equivocation that the difference between dialectical and didactic seeking predisposition accounts unilaterally for those differences in problem sensitivity that can be systematically accounted for in this two-by-two analysis. The values of R^2 full for both these administrations serve to remind us of how much more variation in problem sensitivity must be consigned to "error" in the present analysis, despite the significance of the analysis of variance results.

Table 15 and Figure 9 describe the analysis of variance for the information sources inquiry criterion variable. It can be seen that the findings for this variable are somewhat less clearcut than they are for the problem sensitivity score. During Administration I there is essentially no difference between the dialectical-low GPA group and the two didactic groups, whereas the dialectical-high GPA group is clearly superior to all three. During Administration II however, the two dialectical groups have clearly distinguished themselves from the two didactic groups due to the dramatic rise in scores made by the dialectical-low grade point average group. Thus, the seeking predisposition factor acts as a highly significant determinant of information sources behavior only for Administration II. We can now understand the reason for the very low stability of the information sources variable in terms of the sharp change in scores observed for one of the four groups.

FIGURE 8

MEAN PROBLEM SENSITIVITY SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

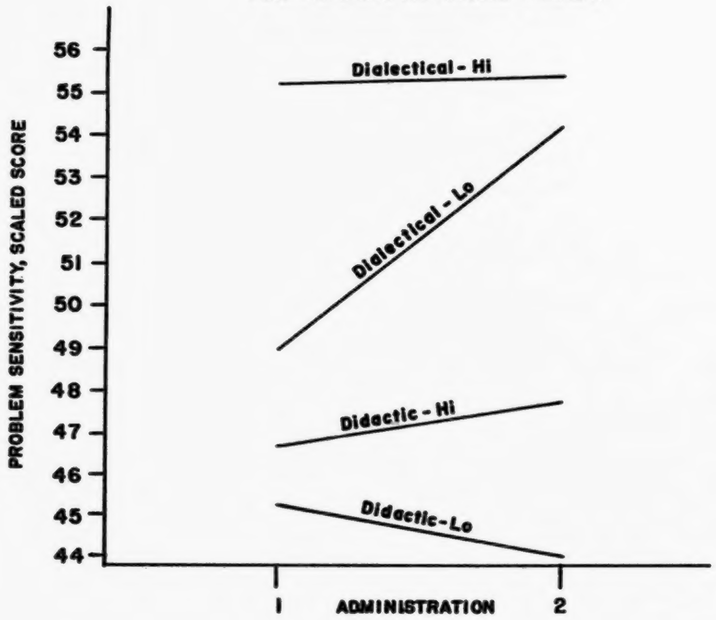


FIGURE 9

MEAN INFORMATION SOURCES SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

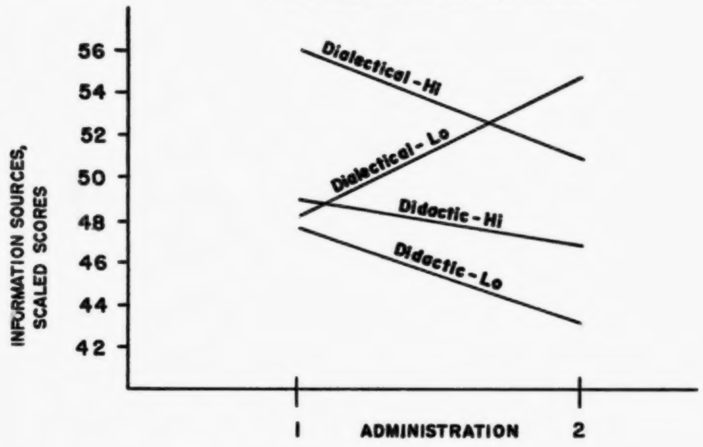


FIGURE 10

MEAN COMPETENCE SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

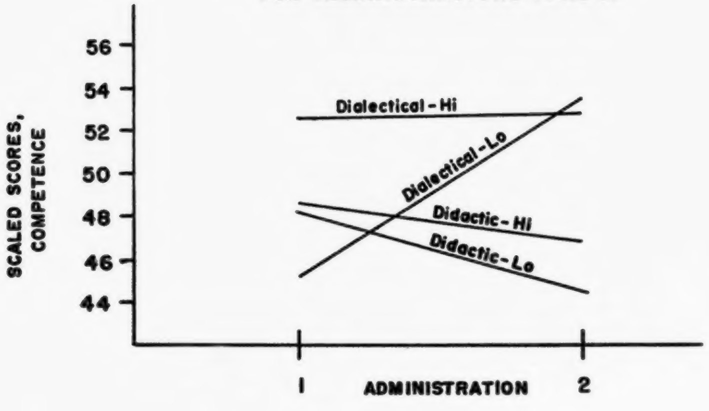


FIGURE 11

MEAN GENERAL INQUIRY SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

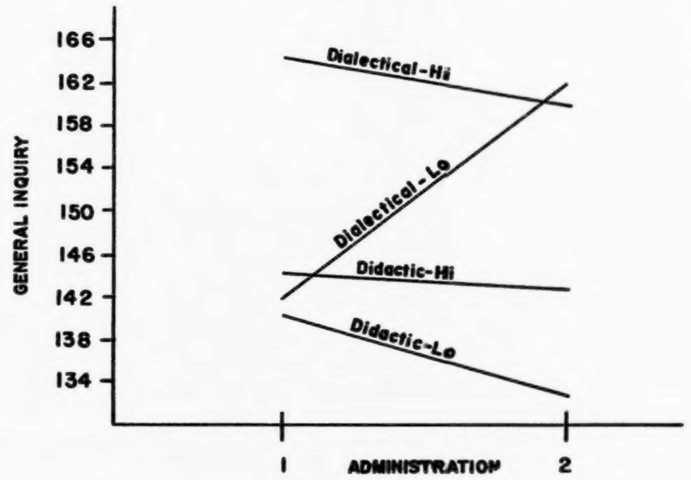


FIGURE 12

MEAN TIME SCORES OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

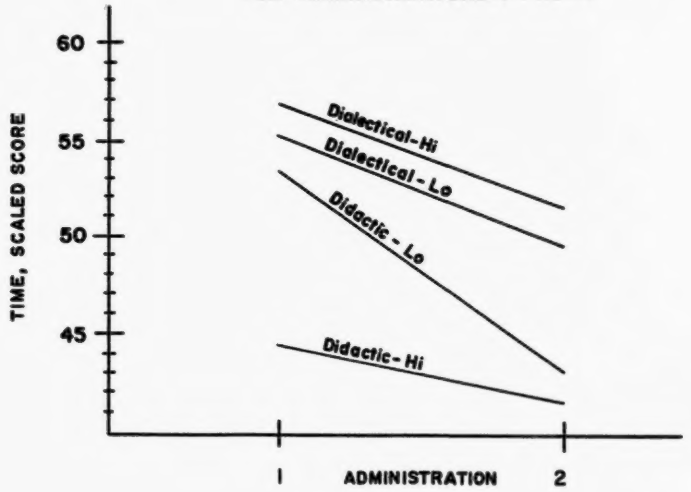


FIGURE 13

MEAN BITS SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

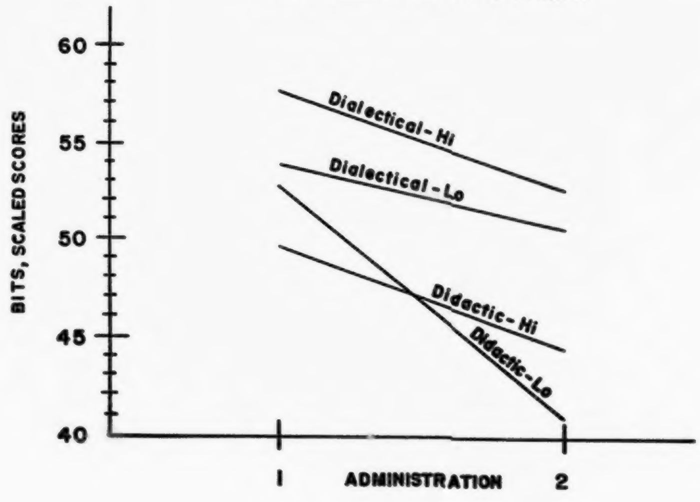


TABLE 14

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF PROBLEM SENSITIVITY SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	55.25 (9.68)	47.00 (8.20)	55.08 (8.25)	46.83 (9.23)
Low GPA	49.00 (6.42)	45.31 (9.73)	54.33 (17.43)	44.08 (7.82)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	414.13	5.30	.03	.05	1	897.35	8.26	.006	.02
GPA	1	172.97	2.21	.14	.13	1	58.24	.54	.47	.17
Interaction	1	60.26	.77	.39	.16	1	15.76	.15	.71	.18
Error	42	78.10				42	108.53			

R^2 full = .18 R^2 full = .18

TABLE 15

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF INFORMATION SOURCES SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	56.25 (10.73)	49.25 (9.57)	51.75 (8.14)	47.58 (7.37)
Low GPA	48.56 (10.19)	47.69 (7.22)	55.11 (14.33)	43.46 (10.57)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	171.37	1.96	.17	.09	1	711.35	7.02	.01	.01
GPA	1	241.18	2.76	.10	.07	1	1.55	.02	.90	.17
Interaction	1	107.92	1.23	.27	.10	1	160.68	1.58	.22	.14
Error										

R^2 full = .13 R^2 full = .17

Table 16 and Figure 10 summarize the data for the competence inquiry variable. The competence variable is in many ways similar to the sources variable. That is, the dialectical-high GPA group is consistently superior to other groups. The dialectical-low GPA group performs poorly on Administration I but then increases its competence scores to the level of its high GPA counterpart during Administration II. In contrast both the high and low GPA didactic groups decrease in competence on Administration II.

We discover for the competence scores a pattern identical to information sources, but contrasting with problem sensitivity. Whereas for problem sensitivity the two dialectical groups are superior to the didactic groups both before and after student-teaching, for competence, as for information sources, GPA is a somewhat more relevant source of variation for Administration I. By Administration II its influence has dropped out completely. The variability of scores is sufficient to attenuate any strong interaction effect during Administration I. However, it is clear from the figures for all three variables that the dialectical-high GPA group is superior to all others on Administration I, with both dialectical groups equally superior on Administration II.

Table 17 and Figure 11 summarize the findings for general inquiry. These are consistent with the earlier data, since general inquiry is a summation of the previous three variables. During Administration I the effect of GPA is slightly greater than that of seeking style. The superiority of the dialectical-high group is reflected in the slightly elevated value of F for the interaction source. By Administration II the superiority of the dialectical groups is clear. For that latter administration we are able to account for nearly 20% of the variation in general inquiry using the two dichotomous factors alone.

Time and bits are not technically inquiry criterion measures. They describe *how long and how much* a subject inquired. Tables 18 and 19 and Figures 12 and 13 summarize the findings for these two scores. It can readily be seen that the two dialectical groups spend far more time in inquiry than do their didactic counterparts. There is a

TABLE 16

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF COMPETENCE SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	52.67 (9.36)	47.58 (8.76)	52.58 (11.11)	49.75 (9.14)
Low GPA	45.56 (5.20)	48.31 (8.35)	52.78 (15.43)	44.54 (6.06)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	3.11	.04	.84	.09	1	531.00	5.02	.03	.01
GPA	1	162.25	2.27	.14	.04	1	20.12	.19	.66	.11
Interaction	1	132.14	1.85	.18	.04	1	25.23	.24	.63	.11
Error	42	71.47				42	105.93			

R^2 full = .09 R^2 full = .12

TABLE 17

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF GENERAL INQUIRY SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	162.92 (23.02)	143.83 (22.62)	159.42 (22.20)	142.50 (18.06)
Low GPA	144.22 (17.10)	141.38 (22.74)	162.22 (45.08)	132.85 (20.39)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	1259.38	2.37	.13	.11	1	6349.02	8.79	.005	.02
GPA	1	1715.56	3.28	.08	.09	1	178.57	.25	.62	.19
Interaction	1	878.91	1.68	.20	.12	1	469.54	.65	.43	.18
Error	42	552.86				42	721.88			

R^2 full = .16

R^2 full = .19

significant interaction for first administration because the didactic-low GPA group spends almost as much time in inquiry as the two dialectical groups. By Administration II, this interaction has completely disappeared. As indicated earlier amount of time expended generally drops for all groups on second administration.

The values of R^2 for time are high. On Administration I fully 31% of the variance in time can be accounted for. Less is accountable during the subsequent administration.

Results for bits parallel those for time, though less striking. Seeking style is the major source of variation during both administrations. Although only 10% of the variance is accountable during Administration I, the value of R^2 rises to .22 for Administration II.

It would appear that problem sensitivity, time and bits operate in a similar manner during Administration I, with seeking style the most influential source of variation. This suggests the hypothesis that time is more closely bound up with problem sensitivity than it is with the other inquiry criterion variables. For information sources and competence GPA is a more influential source during that administration. It must be pointed out that it is the performance of the dialectical-high GPA group that contributes most powerfully to that finding. We must now ask if these variables are differentially predictable by the determinants of inquiry. In the discussion section we will examine some possible reasons for the differences we have encountered and attempt to account for the shifts in the use of bits and time.

The Determinants of Inquiry

Having identified the relative influences of general seeking predisposition and GPA on the inquiry criterion variables, we now turn to a more detailed analysis of the relations of each of the many possible determinants of inquiry to the measures of inquiry performance. We will examine these relations individually in the form of single correlation coefficients. We will also study the effects of the predictor variables in concert by use of step-wise multiple regression analyses.

TABLE 18

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF TIME SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	56.71 (7.57)	44.43 (8.53)	51.42 (10.24)	41.51 (7.07)
Low GPA	55.30 (6.75)	53.36 (5.93)	49.58 (12.30)	43.00 (5.95)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	570.26	9.87	.001	.14	1	767.13	8.48	.006	.01
GPA	1	159.45	2.76	.104	.26	1	.32	.00	.953	.18
Interaction	1	301.78	5.22	.027	.22	1	31.29	.35	.560	.17
Error	42	57.80				42	90.49			

R^2 full = .31

R^2 full = .18

TABLE 19

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF BITS SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	57.75 (8.96)	49.75 (9.61)	52.41 (8.99)	44.50 (8.46)
Low GPA	53.89 (7.74)	52.77 (9.09)	50.56 (13.89)	40.92 (6.64)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	238.23	2.95	.093	.04	1	900.35	9.95	.003	.03
GPA	1	1.49	.02	.892	.10	1	75.29	.83	.367	.20
Interaction	1	132.07	1.64	.208	.07	1	6.31	.07	.793	.21
Error	42	80.73				42	90.49			

R^2 full = .11

R^2 full = .22

Table 20 reports the correlations between 18 selected predictor variables and the six inquiry process measures for both administrations of the in-basket. To remain consistent with the preceding section the data for the same 46 subjects are employed. A parallel table, reporting the correlations for the total sample of 56, is included as Table D-3 in Appendix D. The Average Time and Total Errors are derived from performance on the test of reflection-impulsivity, Matching Familiar Figures. All of Chapter VIII is devoted to analysis of the data from that instrument.

It can be observed from Table 20 that, in general, inquiry performance is somewhat more predictable for Administration II. Those variables which predict inquiry best are Complexity, Politics, Beliefs, Word Association and Reading. Politics and Reading have not previously been discussed in this report because they were not parts of the six-test battery defining seeking predisposition.

The MSU Reading test, excerpts of which appear in Appendix C is a test that measures the ability to comprehend, analyze, interpret and make appropriate inferences about selected passages on social science, literary, historical and natural science topics. It is thus a test of general verbal problem-solving as much as a test of simple reading ability. For our samples, the Reading test taken before the freshman year predicted senior grade point average with a correlation of .72 for our first year group (N=30) and .54 for the second year group (N=56).

The Politics score is derived from three items of the autobiographical inventory (See Appendix C): political party preference of the subject's parents, the subject's political identification on a five point Likert scale from very conservative to very liberal, and a rank-ordering of preference for four possible presidential candidates--Barry Goldwater, Lyndon Johnson, Robert Kennedy and George Romney. High scores on this three item scale reflected political liberalism. The possible range in scores was 0-10. It is most striking that such a simple scale should correlate so highly with variables as complex and behaviorally remote as competence (r = .53), problem sensitivity

TABLE 20

CORRELATIONS OF 18 SELECTED PREDICTOR VARIABLES WITH INQUIRY CRITERION VARIABLES FOR FIRST AND SECOND ADMINISTRATIONS (N=46), YEAR TWO[a]

Inquiry Variable	Competence		Problems		Sources		Time		Bits		General Inquiry	
Administration	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Complexity	-08	33	14	43	-06	35	37	57	10	27	00	42
Lect.-Disc.	-23	18	00	18	-09	12	20	09	06	17	-11	18
Beliefs	10	33	24	37	00	24	42	37	23	36	13	35
GPA	10	09	12	18	08	11	-24	04	-05	20	11	14
Word Ass'n.	10	35	38	42	21	35	37	38	18	38	27	42
Closure Flex.	-08	13	19	26	11	30	10	20	06	27	09	26
Syllogism-Risk	-09	26	15	24	21	25	-04	20	00	30	11	28
Test Anxiety	-15	-11	-21	-24	-24	-23	08	-09	13	-16	-23	-22
Defensiveness	14	-27	09	-13	-05	-14	12	-07	-24	10	-04	-21
Politics	05	53	05	39	01	19	39	46	22	25	04	41
Ave. Time	00	-15	04	02	-08	18	05	10	-08	00	-05	02
Total Errors	-02	-17	-15	-25	-08	-21	-12	-21	-18	-06	-10	-24
Block Design	07	04	09	09	07	08	21	05	11	13	09	08
Stroop	-17	12	-20	09	-15	-07	-21	00	-14	00	-20	05
Reading	17	33	45	38	33	34	09	27	26	18	37	39
CQT Num.	-08	-01	03	-03	08	-14	-17	-12	00	07	02	-07
CQT Total	01	19	27	20	27	08	-07	08	11	22	22	18
Rorschach Dd%	-07	-14	-27	-36	-13	-24	-24	-27	-25	-40	-19	-30

---

[a] For N=46, the probability of a correlation of .29 occurring by chance is $\leq$ .05; the probability of a correlation of .35 is $\leq$ .01. (two-tailed tests)

(.39) and time (.46). Since the two forms of the in-basket are practically devoid of any materials directly relevant to the political arena, this finding strongly supports the notions that the same dynamics that underly choice of political and social values predispose one to dialectical cognitive functioning. This finding is quite congruent with the work of Rokeach (1960) and of Harvey, Hunt and Schroeder (1961).

Several variables consistently reflected negative correlations with inquiry variables. Among these were Rorschach Dd%, Test Anxiety and Total Errors on the Reflection-Impulsivity task (Matching Familiar Figures). The Dd% score represents that proportion of a subject's responses to the ink-blots which are categorized by Beck (1961) as very small details. Hence, individuals high in inquiry performance tend to be low in test anxiety, to make few errors in Matching Familiar Figures and not to compulsively pick out small details on the Rorschach.

We should reiterate here that such findings are most striking under conditions where clear types are being examined. It can be observed in Table D-3, Appendix D, that as the sample grows to include subjects falling outside the dialectical-didactic predisposition typology, the magnitudes of the correlations decrease slightly.

We now wished to identify that combination of predictor variables which account for the highest proportion of total variance in the individual inquiry criterion variables and thus could most appropriately be considered the *determinants of inquiry* in this research. A series of step-wise multiple regression analyses were conducted for this purpose using seventeen predictor variables on the same data upon which the preceding correlations were based. Only Rorschach Dd%, of all the variables included in Table 20, was not included in the regression.

Tables 21-26 report the step-wise multiple regression findings for the 17 predictors regressed on each of the inquiry process variables. Whenever the level of R^2 reached a point within 5% of the highest R^2 for that analysis, we adopted the convention of not listing the remaining variables individually.

TABLES 21 AND 22

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF PROBLEM SENSITIVITY AND INFORMATION SOURCES, ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=46) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table 21 - Problem Sensitivity

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	45	20	Complexity	43	18
Word Association	48	23	Test Anxiety†	52	27
GPA†	52	27	Politics	56	31
Politics†	55	30	Total Errors†	60	36
CQT Numerical†	56	32	Defensiveness†	62	38
Lecture-Discussion†	57	33	Stroop	63	40
Syllogism-Risk	58	34	Reading	64	43
Beliefs	59	35	+10 Other Variables	69	48
+9 Other Variables	64	40			

Table 22 - Information Sources

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	33	11	Reading	34	12
Syllogism-Risk	37	13	CQT Number†	44	19
Lecture-Discussion†	40	16	Closure-Flexibility	53	28
GPA†	43	18	Syllogism-Risk	61	37
Block Design	45	20	Lecture-Discussion†	62	39
CQT Number†	46	21	Complexity	65	42
Average Time†	48	23	CQT Total†	66	44
+ 10 Other Variables	52	27	+10 Other Variables	70	49

† indicates negative regression weight

TABLES 23 AND 24

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF COMPETENCE AND GENERAL INQUIRY, ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=46) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table 23 - Competence

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Lecture-Discussion†	23	05	Politics	53	28
Reading	29	09	Total Errors†	56	32
CQT Total	33	11	Average Time†	63	40
Block Design	37	14	Defensiveness†	67	44
Closure Flexibility†	39	15	Stroop	69	47
Stroop†	41	17	Reading	70	49
Test Anxiety†	43	19	CQT Total†	72	51
+10 Other Variables	49	24	+10 Other Variables	74	55

Table 24 - General Inquiry

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	37	14	Politics	41	17
Stroop†	40	16	Reading	52	27
CQT Number†	43	18	CQT Number†	55	31
Lecture-Discussion†	46	20	Closure-Flexibility	61	37
Syllogism-Risk	47	22	Syllogism-Risk	66	44
Block Design	49	24	Total Errors†	68	46
Average Time†	51	26	Defensiveness†	68	47
+10 Other Variables	56	31	Complexity	69	48
			+9 Other Variables	73	53

† indicates negative regression weight

TABLES 25 AND 26

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF TIME AND BITS, ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=46) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table 25 - Time

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Politics	39	15	Complexity	57	32
Stroop†	46	21	Lecture-Discussion†	67	45
CQT Number†	53	28	Syllogism-Risk	71	50
Defensiveness	59	35	CQT Number†	72	52
Block Design	66	44	Reading	74	55
Beliefs	69	47	+12 Other Variables	78	60
GPA†	71	51			
+10 Other Variables	74	54			

Table 26 - Bits

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	26	07	Beliefs	36	13
GPA†	35	12	Syllogism-Risk	47	22
Defensiveness†	42	18	Closure-Flexibility	51	26
Total Errors†	45	20	Defensiveness	55	30
Average Time†	48	24	Lecture-Discussion†	57	32
Test Anxiety	51	26	CQT Number†	58	34
Politics	53	28	+11 Other Variables	62	39
+10 Other Variables	57	33			

† indicates negative regression weight

The results are not surprising in the light of the data reported earlier in this chapter. First, it should be observed that the amount of variance accounted for by sequentially adding discrete variables far exceeds that accounted for in the analyses of variance which we reported above. For example, the R^2 full for problem sensitivity is .18 for both analyses of variance. In the multiple regression analyses the total R^2 values are .40 and .48 for the two administrations. Such is consistently the case for all variables. Also as expected, substantially more variance is accounted for at Administration II.

Second, those variables whose individual correlations with inquiry were highest tend also to be added to the regressions earliest. Exceptions will appear when two variables correlating highly with a criterion also intercorrelate at a high level. In that case one of these will be added early, while the other may not appear until much later because of the large common variance they share.

Finally, it may be observed that variables more often associated with aptitude or academic achievement (e.g., Reading, GPA, CQT) are added earlier for Administration I than for Administration II. This is consistent with the ANOVA findings for the relative influences of seeking predisposition and GPA during the two administrations. In general the most potent predictors of inquiry appear to be Politics, Beliefs, Word Association, Complexity and Reading, all with positive regression weights; and Test Anxiety, MFF Total Errors and Defensiveness with negative regression weights. We have included Tables D-4 - D-9 in Appendix D, where the same regressions are reported for N=56, so that the two analyses can be compared. The differences are more generally of magnitude of variance accounted for rather than of order of the variables added.

General Discussion

It would appear in general that the anticipations which generated this study concerning the relations between certain elements of personality structure which were denoted as the dialectical pattern, and inquiry performance as measured by the teacher's in-basket have been confirmed. The general prediction made for the potency of the seeking predisposition factor in predicting inquiry performance was rather uniformly supported. However, a number of comments needed to be made concerning some details of this supporting body of data.

First, there is no question but that the group which was both dialectical and high in academic achievement was consistently superior to all other groups on inquiry performance. Of great interest was the dramatic shift in inquiry performance of the dialectical-low academic achievement group between the first and second in-basket administrations. It would appear that this group profited most either from the practice afforded them by the first in-basket administration, the experiences of the intervening student teaching period or, most likely, from both of these factors. Possession of the dialectical style does not automatically lead to excellence in inquiry of itself. Rather, it predisposes the person to being able to profit from experiences with both inquiry and, in this case, teaching, to develop inquiry competence at a later point.

The dialectical-low GPA group needed only some in-basket practice and/or teaching experience in order to manifest the inquiry promise which had already in Administration I been reflected in their high problem sensitivity scores. In terms of the theoretical model, problem sensitivity is the first stage of inquiry and does not itself guarantee inquiry competence. The data demonstrate clearly that the dialectical-low GPA group already manifested during Administration I the willingness to engage in the inquiry process characteristic of good inquirers reflected in their higher time scores. They were also already high in problem sensitivity. They had not yet learned how to use information sources effectively in order to generate high inquiry competence. By Administration II they had managed to put all the other pieces together. They continued to expend more time and to be high in problem sensitivity. Their resulting inquiry competence then became equal to that of their dialectical-high GPA colleagues.

In contrast, the didactic groups, whether of high or low academic achievement, generally remained the same or dropped on the inquiry variables between the first and second administration. The amount of time they spent on inquiry decreases even more between first and second sessions than it does for the dialectical groups. On second administration the dialectical groups spent an average of 115 minutes in inquiry, while the didactic groups spent an average of 92 minutes in inquiry. This is a difference of 23 minutes (or 25%) between these two groups.

Another dimension of comparison involves expected regression toward the mean. We would anticipate on the basis of general statistical regression that whatever differences would hold between the members of these two groups on Administration I would generally diminish on Administration II. Instead, it appears that the differences between the two groups become accentuated over time. That is, the dialectical groups become more dialectical and the didactic groups become more didactic. In every one of the inquiry process scores, there is a greater difference between the dialectical and didactic groups during Administration II than there had been for Administration I.

Examination of the correlational and multiple regression analyses also reveals interesting relationships. First, a small number of attitude and values measures account for a great deal of the variance in inquiry performance. Thus, both the nonstereopathy score of the Inventory of Beliefs and the Political values score contribute greatly to the prediction of inquiry performance. On a basis of our data we can characterize the person high in general inquiry as high in associational fluency (a test used by Getzels and Jackson as one of their indices of creativity); high in cognitive complexity, preferring the ambiguous, the assymetrical and the unexpected to the regular, articulated and predictable; liberal in political values; willing to risk on a test of logical thinking; high in verbal problem solving; and low in expressed test anxiety. With a combination of these and a few other variables we are able to account for about 50% of the measureable variance in general inquiry behavior during Administration II.

We may get a rough estimate of the loss of predictive precision which occurs when individuals who cannot be fitted into types are made part of the sample by examining the change in the proportion of variance that can be accounted for in inquiry behavior by our determinants when the 46 subjects who are members of the types are compared with the same analyses using 56 subjects including the ten who are inconsistent or "pattern" subjects. It can be seen from comparing Tables 21-26 with their counterparts in Appendix D that by increasing the size of the sample less than 25% with individuals who do not fit the earlier type, we lose between 5 and 10% of the predictable variance. This is more than we would expect to lose by increasing the sample size alone.

It may be possible to estimate what proportion of the population of teachers-in-training at large is covered by our research through recalling that of 113 subjects who volunteered to participate in the study, only 51, or 45%, were selected as representative of our typology. Recognizing that the population of volunteers is not identical to the total population of students in teacher training programs, we would conservatively guess that our findings could be generalized only to that 35% to 40% of the teacher training group which can be consistently and systematically categorized into a dialectical-didactic classification. It would appear that the other dimension upon which selection was made, college grade point average, is less relevant to inquiry. In the present study grade point average acted as a generally continuous variable and had a dramatically minor impact upon the findings.

As we build those tenuous nomological nets which are more often noted for their lacunae than for the tensile strength of their connections we must recognize more frequently that many of our generalizations are only differentially valid--holding for certain subgroups of the population and not for others. We have attempted to avoid in this research the error of both Getzels and Jackson and Wallach and Kogan in suggesting that our data generalize to all inquirers. If we as writers occasionally slip, we would hope that our readers would exercise for themselves the *caveat* which we have earlier enunciated.

We will speculate on the nature of the inquiry process in far greater detail on the basis of later data analyses. At this juncture, it may be reasonable to communicate our speculations as they stand on the basis of the analyses that have been conducted thus far. It seems that the inquiry process involves at least two stages. The first stage is the commitment to involve oneself in inquiry. This is what occurs when the individual decides to open himself up to engage in the inquiry process. The second stage occurs when, having opened himself up to whatever extent he had determined, he engages in the sensing, formulating, searching, and resolving aspects of inquiry. The measure which reflects most directly on the willingness to inquire is the amount of time the subject chooses to spend in inquiry. Time, in turn, most directly influences the problem sensitivity score. If a subject spends a good deal of time in inquiry and problem sensitivity is high during that time, we have a picture of an individual who has, in Schachtel's terms, allocentrically opened himself up to the process of inquiry. He is willing to risk whatever is necessary in order to deal with the universe about him. Such are the characteristics of both dialectical groups on both administrations.

Persons low both in problem sensitivity and in time have chosen to avoid interaction with the discrepant. An individual high in time but low in problem sensitivity may be reflecting a willingness to inquire, but an inability to cope with the task demands. An individual high in problem sensitivity but low in time may simply be a very efficient dialectical seeker.

This picture of inquiry makes the inquiry process analogous in some ways to the operation of a camera. There are three dimensions which determine the clarity of the picture taken by a camera. The first is the amount of time the shutter remains open. The second is the quality of the lens. The third is the sensitivity or speed of the film used in the camera. All things being equal, the longer the shutter is left open, the stronger the impression made by the light on the film. If the shutter is open adequately, but the lens distorts the image, the total impression is lost. If the shutter is not open, no level of film sensitivity will lead to a good impression.

We see time as analogous to shutter speed, problem sensitivity to focal resolution of the lens and film speed to inquiry competence. The dialectical-high GPA subject has all three components operating in his favor even before he has an opportunity to practice at teaching or "in-basketing." The dialectical-low GPA inquirer has shutter open (high on time) and lens focused (highly problem sensitive) but on first administration has insufficient film speed (competence) to succeed generally. However, film speed can be improved through experience. By Administration II there is not much difference in inquiry behavior between the high and low GPA dialectical inquirers.

The didactic-high GPA subjects keep shutter speeds low and lens moderately out of focus. But they do possess high film speed and hence do not do too badly on competence for Administration I. The didactic-low GPA subjects lack both film speed and focal resolution. They appear to keep shutters open during Administration I, but this is probably a function of general slowness to cope with task demands. On Administration II, didactic seekers shut down the shutters as early as possible. Hence they drop down significantly below dialectical seekers for all inquiry process variables.

In this chapter we have identified the general determinants of inquiry performance as well as some aspects of the interrelations among the inquiry components. We have also, by comparing inquiry performance for different subgroups at Administrations I and II, caught a glimpse of the underlying dynamics of the inquiry process. In the next two chapters we shall pursue further the question of what the inquiry process itself entails. What do successful inquirers do? How do they spend their additional inquiry time? It is to questions such as these that we now turn.

CHAPTER V

PROCESS ANALYSIS OF INQUIRY PERFORMANCE
PART I. COGNITIVE SHIFTING

At this point in the inquiry comprising this research report, we have established the following findings. Reliable and stable measures of aspects of the inquiry process can be gathered through simulation of a set of teaching problems using the Teachers In-basket. Through using a combination of predictor variables characterizing different personality-cognitive style types, significant predictions can be made of the inquiry behavior of teachers-in-training as subjects. No single variable was particularly outstanding for predictive quality, but the combination of predictors was extremely effective. Considering the great complexity of the criterion behaviors being studied, this ought to have been no great surprise. When the cluster of predictor variables were present together in the same direction, i.e., when the subject's predictor configuration approached a theoretical ideal type previously labelled as dialectical or didactic, this configuration was prepotent and the subject's college GPA became essentially irrelevant as a predictor.

We characterized three aspects of the process of inquiry: problem sensitivity, information sources and competence. The problem sensitivity variable reflected the subject's threshold for the discrepant or the discontinuous. Irrespective of how well he was able to integrate the sensed discrepancies or the manner in which he sought them out, the problem sensitivity score reflected the number of potentially problematic elements reacted to as problematic by the subject. The information sources measure reflected the range of types of sources used by the subject in the course of his inquiry. It thus was one way of examining the breadth of the inquiry conducted. The competence score reflected the degree of completion or comprehensiveness to which the subjects' problem resolutions were brought. Subjects high in competence were those who came to the deepest and the most complete level of understanding with respect to the general problems embedded in the in-basket materials. A modicum of problem sensitivity and information seeking was surely a prerequisite to competence, but was clearly not sufficient to insure competence.

In order to summarize the general calibre or character of inquiry a single summary score was generated for each subject and called General Inquiry. This score was generated by summing the T score equivalents of the three measures just reviewed into a single summary measure.

In the last chapter we reported that the dialectical and didactic seekers differed markedly in the manner in which they conducted their inquiries. Most important was the observation that dialectical seekers spent more time in the process of inquiry than did didactic seekers. In the course of this greater time spent they attended to more materials than did their didactic counterparts. Thus it was not necessarily some greater absolute sensitivity to the discrepant *per se* which distinguished the dialectical seekers, so much as a willingness, even a need, to engage in the inquiry process. This was the case whether the dialectical seekers were of high or low grade point average. Since scores on the Reading test were positively and significantly correlated with the inquiry variables, it was also not a matter of the dialectical seekers reading more slowly. They simply were reading more and in a different way. After the student-teaching experience, while the didactic seekers dropped dramatically in the amount of time spent across the board, the dialectical seekers dropped substantially less.

Cognitive Shifting

Although we had already established that the measures of problem sensitivity, information sources, and competence distinguished effectively between kinds of inquirers, we felt that more sensitive analyses could yet be accomplished. Was there any difference in the manner in which individuals high or low in problem sensitivity conducted their inquiries? Was there any way to achieve insight into sequential patterns or strategies of inquiry?

In order to investigate that question an entirely new mode of analysis was developed and applied to the Year Two data. Only the Year Two data were examined in this way because of the amount of time required to reanalyze each protocol and because of the greater reliability and comprehensiveness of the written logs taken during the second year.

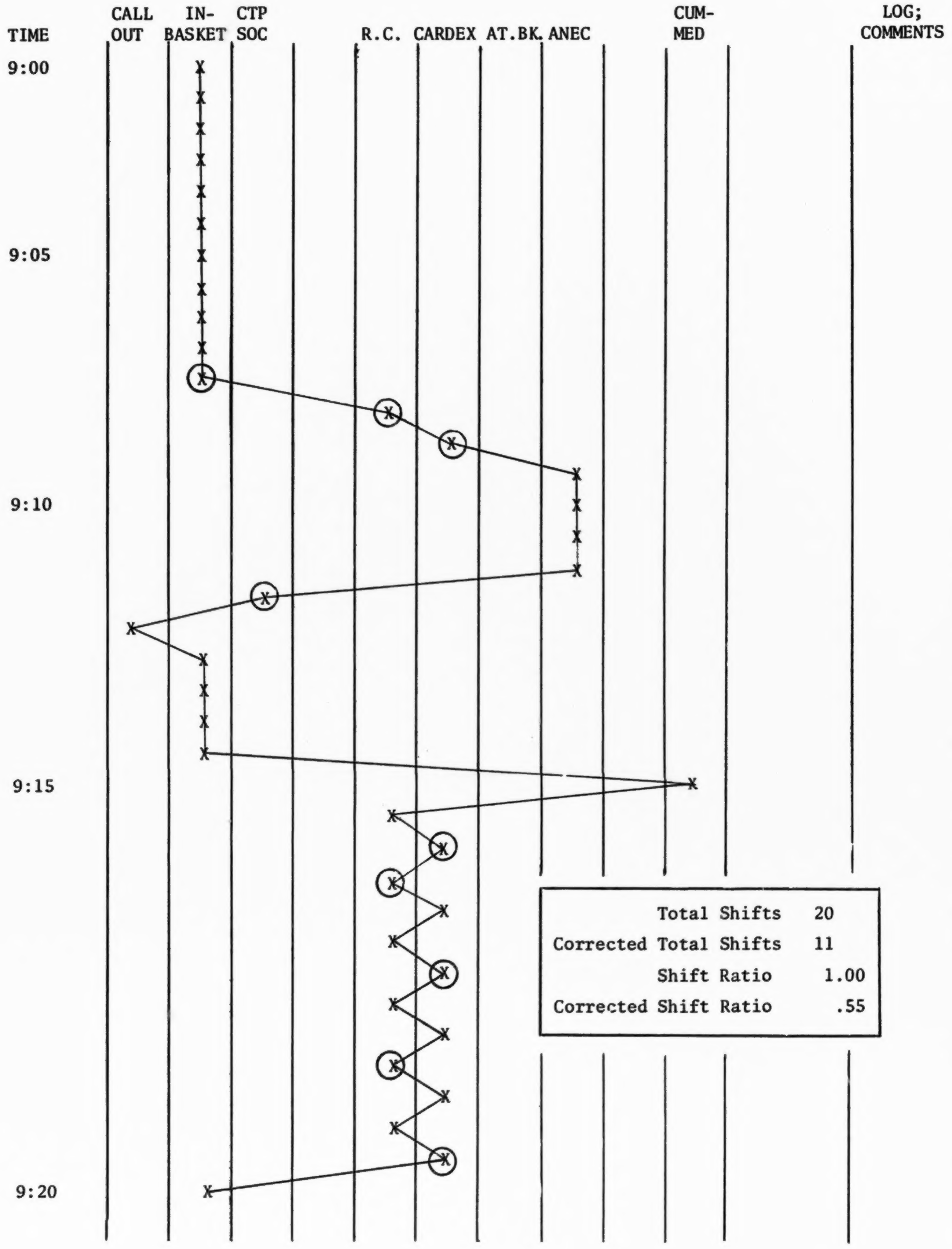
The purpose of this analysis was to examine the path taken by each inquirer through the materials available to her in the in-basket. Our goal was to draw a sequential bit-by-bit map of each individual's inquiry process in order to examine the kinds and order of steps she had taken.

Figure 14 represents the first twenty minutes of a hypothetical subject's inquiry behavior. The form is divided into eight columns representing the eight major kinds of materials that can be used in the in-basket. Each horizontal line represents an additional bit of material attended. The left margin is used to note time while the right margin is employed to indicate what the subject is doing at the moment. An X on a particular line indicates that the subject has attended to a piece of material at that point. If the X is circled the act of attention has resulted in a sensed problem.

Our hypothetical subject in Figure 14 begins his inquiry by moving in a surveying fashion through the in-basket materials for approximately the first seven minutes. He is working slowly and carefully. Then, before he has completed his survey of the in-basket contents themselves, something in the in-basket keys off a question

FIGURE 14

SEQUENTIAL ANALYSIS OF INQUIRY RECORD FOR HYPOTHETICAL SUBJECT



which leads him to seek out information from the report cards. The report card that he looks at sends him in turn to a cardex and then to an anecdote. He reads three additional anecdotes, then shifts back to examine the class sociogram after which he calls out to the secretary requesting a youngster's cumulative folder. While waiting for the cumulative folder to arrive he completes his survey of the in-basket materials and then proceeds to examine the cumulative folder which he has requested. At those points when he has identified a problem, the X is circled.

In our analysis of such sequences we were prepared to characterize sequence or strategy types in rather global descriptive terms and we shall discuss them in those terms at a later point in this report. Initially however we attempted to develop some quantitative measures that would reflect the character of the inquiry process engaged in by the subject. The measure derived grew directly out of the conception underlying the notion of a dialectical seeker. Both in philosophy and pedagogy the concept *dialectic* implies the comparison and contrast of alternatives, the juxtaposition of different sources in the service of the same inquiry, the concordance of differences. Since our conception of dialectical inquiry involved this notion of shifting between the sources of information in order to juxtapose potentially conflicting pieces of evidence to generate new insights, we anticipated that a characteristic of individuals who were high in general inquiry would be that they would engage in this process of cognitive shifting with greater frequency than those individuals who were low on general inquiry. In terms of our diagrams we defined the cognitive shift as any move from one source column to another. If an individual has a succession of bits within the same column, it is an indication that he is working within a single source rather than attempting dialectically to manipulate and juxtapose different sources of his inquiry.

The cognitive shift was scored in two slightly different ways. First, the total number of shifts in the entire inquiry sequence were counted. This sum was given the name Total Shifts. Second, these were rescored by subtracting from them those shifts that were parts of a repeated back-and-forth pattern between the same two sources over a long sequence of bits. This pattern, which we call "stitching," was hypothesized to reflect less a dialectical juxtaposition of sources than a possible perseveration of pattern. The Corrected Shift score involved a subtraction of the perseverated stitching shifts from the total number of shifts.

Stitching behavior can be seen in Figure 14 between 9:15 and 9:20. The effects of the different scoring procedures is reflected in the Total Shifts score of 20 for that twenty minute inquiry period in contrast to a Corrected Shifts score of 11. Over a full inquiry record it was rare for the corrected score to deviate that markedly from the simple total score.

The stabilities for these shift scores are reported in Table 27. It will be noted that the two measures of shifts are both reasonably stable, with the corrected shifts total score achieving a level of stability greater than any other of the in-basket process measures heretofore examined.

TABLE 27

STABILITY OF SHIFT-MEASURES
BETWEEN ADMINISTRATION ONE AND TWO (N=56)

Variable	Stability
Shifts (total)	.40
Shifts-Corrected (Total)	.50
Shift Ratio	.39
Shift-Ratio Corrected	.45

Tables 28 and 29 report the correlations between these two shift measures and other inquiry process variables for each administration of the in-basket. We can see that, as anticipated, the shift measures correlate positively with the other inquiry process variables. It is clear that individuals who are high in their general inquiry scores also tend to be quite high in total shifts scored in either manner. It also appears quite clear that the score for cognitive shifting is not identical with the score for total amount of time spent or total number of bits attended to. That is, those high in general inquiry do not score well on shifts simply because they spend more time on inquiry.

TABLE 28

CORRELATIONS OF SHIFT-PROCESS VARIABLES WITH OTHER INQUIRY PROCESS VARIABLES, ADMINISTRATION ONE (N=56), YEAR TWO[a]

Variable	Total Shifts	Total Corrected Shifts	Shift Ratio	Corrected Shift Ratio
Problem Sensitivity	.69	.68	.47	.47
Information Sources	.68	.71	.53	.57
Competence	.62	.62	.55	.57
Bits	.65	.62	.42	.39
Time	.52	.52	.00	.00
General Inquiry	.75	.76	.58	.61

[a] For N=56, the probability of a correlation of .27 occurring by chance is $\leq .05$; the probability of a correlation of .31 is $\leq .01$. (two-tailed tests)

TABLE 29

CORRELATIONS OF SHIFT-PROCESS VARIABLES WITH OTHER INQUIRY PROCESS VARIABLES, ADMINISTRATION TWO (N=56), YEAR TWO[a]

Variable	Total Shifts	Total Corrected Shifts	Shift Ratio	Corrected Shift Ratio
Problem Sensitivity	.54	.55	.20	.25
Information Sources	.58	.60	.36	.41
Competence	.37	.44	.08	.20
Bits	.56	.54	.44	.46
Time	.54	.60	.06	.15
General Inquiry	.56	.60	.26	.33

[a] For N=56, the probability of a correlation of .27 occurring by chance is $\leq .05$; the probability of a correlation of .31 is $\leq .01$. (two-tailed tests)

What is the relationship between number of shifts and the predictor groups which we analyzed in the previous chapter? Table 30 and the accompanying Figure 15 represent the scores on the Total Shifts for the four predictor groups used in this study. It can be seen that once again the distinction of dialectical and didactic subjects significantly differentiates between those who shift quite a lot and those who do not, irrespective of grade point average. The differences, while significant at Administration I, are not at Administration II, although the general order of the scores remains the same.

TABLE 30

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF TOTAL SHIFTS FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	114.25 (35.89)	81.83 (29.22)	89.08 (44.06)	70.67 (21.09)
Low GPA	92.33 (32.76)	82.23 (30.07)	88.89 (52.63)	77.08 (43.01)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	5096.93	4.98	.031	.06	1	2576.17	1.53	.223	.00
GPA	1	1305.54	1.28	.265	.14	1	108.93	.07	.800	.04
Interaction	1	1403.77	1.37	.248	.14	1	122.98	.07	.788	.04
Error	42	1023.72				42	1681.13			
	R^2 full = .16					R^2 full = .04				

FIGURE 15

MEAN SHIFT SCORES OF FOUR SUBJECT GROUPS FOR ADMINISTRATIONS I AND II

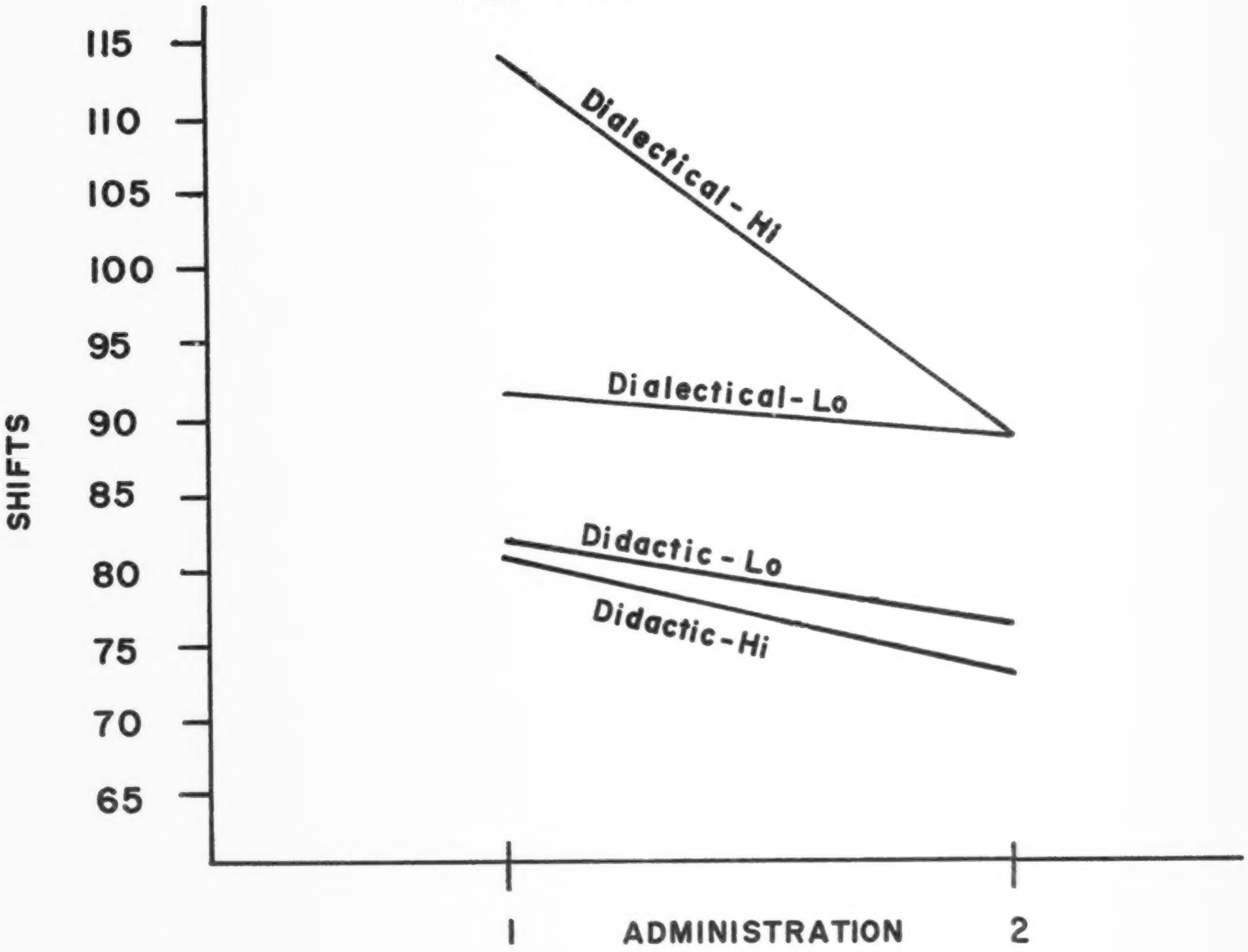
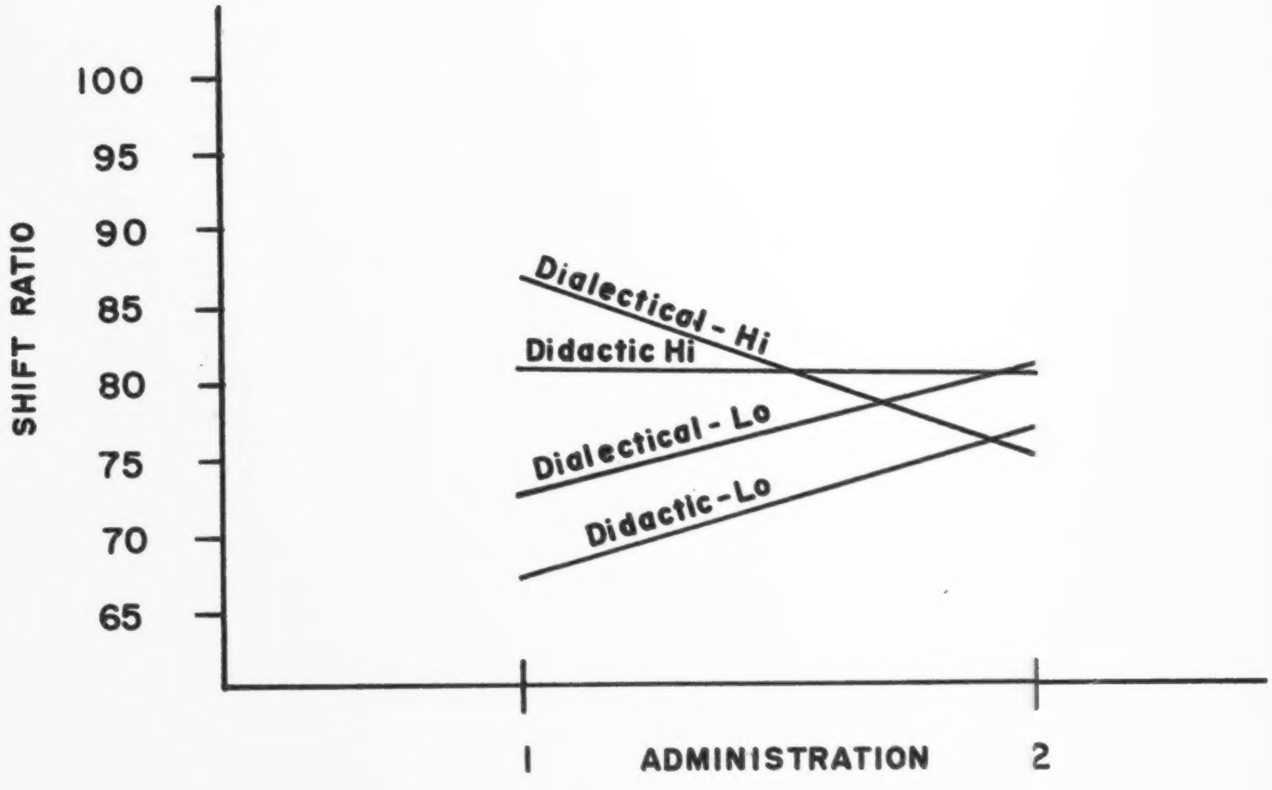


FIGURE 16

MEAN SHIFT RATIO SCORES OF FOUR SUBJECT GROUPS FOR ADMINISTRATIONS I AND II



The Shift Ratio

We now confronted the idea that, despite the absence of an isomorphism between shifts and time, there still should be an attempt to correct the shifts score for differences in time. That is, would we find that not only do individuals with high general inquiry scores shift more often over the course of inquiry, but that also they have a higher incidence of shifts per minute of inquiry? To answer this question we developed the *shift ratio*. This score could take two values depending upon whether we used simple shifts or corrected shifts as the numerator of the ratio. In order to facilitate analysis of the data the resulting decimal was multiplied by 100.

Table 31 reports the means and standard deviations for the shift and shift ratio scores on both administrations for the entire sample. It can be seen that the shift correction subtracts an average of five shifts from the total attained by each subject whether on Administration I or Administration II. We see that, on the average, inquirers on Administration II shifted 96 times in the course of inquiry to 81.5 times in the second administration. Using the shift ratio we see that inquirers averaged approximately .8 of a shift per minute of inquiry on Administration I and almost the same amount on Administration II.

TABLE 31

MEANS AND STANDARD DEVIATIONS OF
SHIFT-PROCESS SEQUENCE AND APPROACH MEASURES
FOR ADMINISTRATIONS ONE AND TWO

Variable	Administration 1		Administration 2	
	Mean	S.D.	Mean	S.D.
Shifts (Total)	95.9	34.7	81.5	39.8
Shifts (Corrected) Total	90.5	33.3	76.1	34.5
Shift Ratio	79.7	26.6	77.4	32.7
Shift Ratio Corrected	75.2	25.3	71.2	27.1

TABLE 32

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF SHIFT RATIO SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	88.58 (27.31)	81.58 (19.57)	75.50 (29.25)	81.08 (30.27)
Low GPA	73.44 (21.89)	67.38 (23.58)	81.44 (43.67)	77.69 (38.47)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	480.85	.881	.353	.10	1	9.45	.008	.931	.00
GPA	1	2426.54	4.450	.041	.03	1	18.38	.015	.904	.00
Interaction	1	2.49	.005	.946	.12	1	245.70	.197	.660	.00
Error	42	545.79				42	1250.26			

R^2 full = .12

R^2 full = .00

Referring back to earlier tables of stabilities and correlations it is clear that the shift ratio scores are not dramatically lower in stability than the simple shift measures. Furthermore, even after correcting for time, the shift ratio scores continued generally to correlate significantly and positively with the other inquiry process variables. The effectiveness of the correction for time is seen in the zero level correlations between the shift ratios and the time variable.

It is thus clear that the effective general inquirer not only spends more time in inquiry but also uses that time in a different way. He spends his minutes of inquiry engaging in a much higher level of cognitive shifting than does the less effective general inquirer. He manifests his involvement in the inquiry process by expending more time engaging in it. He also uses that time to maximize the possibility of experiencing problems by dealing with the materials through a strategy of cognitive shifting.

How does the Shift Ratio relate to the predictor groups? A glance at Table 32 and Figure 16 gives the answer. Due to the fact that the Shift Ratio controls for time, which in turn is highly related to problem sensitivity, the main effect for Seeking Style is washed out, leaving only a significant main effect for GPA. This, however, is true only for the first administration. There are no significant differences in the second administration.

It is interesting to note that the correlations between the Total Shifts-Corrected Shifts scores and the original process variables are uniformly higher than the correlations between the Shift Ratio-Corrected Shift Ratio scores and the original process variables. This suggests that the absolute number of shifts made during inquiry has a larger influence on success in in-basket inquiry performance than does the number of shifts per unit of time. This is entirely consistent with and complementary to an earlier finding that effective inquirers are more problem sensitive, spend more time in inquiry and also attend to more materials than do their didactic counterparts.

Cognitive Shifting and the Concept of Dialectic

The findings with respect to the relationship between cognitive shifting and the other components of inquiry serve to clarify our understanding of the nature of competent inquiry behavior. It would appear warranted to suggest that the inquirer who is highly sensitive to problems and manifests competence in the solutions he reaches is characterized by a cognitive process which is analogous in many ways to the philosophical concept of the dialectic.

We are prone to associate the term dialectic with Marxist-Leninist theory or the often obscure philosophical reasoning of Hegel. A common association to the concept of dialectic is Hegel's well known triumvirate *thesis-antithesis-synthesis*. If we examine this concept closely, we will begin to see that the idea of a dialectical process stems originally from the dialogues of Socrates and is mirrored in many of the dynamic theories of human behavior that have so effectively captured the enthusiasm and commitment of contemporary behavioral scientists.

Inherent in the concept of dialectic is the confrontation between a particular position or state-of-mind (thesis) and some alternative or opposing state (antithesis) which results in a consequent imbalance or disequilibrium between the two forces. The resulting state of dynamic tension can only be resolved through a complete obliteration of one of the two opposing forces, through establishment by one force of clear hegemony over the other or through a dynamic reorganization or synthesis wherein the very natures of the two opposing forces themselves is reconstituted as a new configuration (synthesis) is created.

We see in the brilliant dialogues of Plato how Socrates elicits a strong statement of position from his antagonist, takes the principles *implicit* in that position, makes them explicit, and uses them to lead his adversary to generate a new position which opposes his original one, yet is equally consistent with the initiating principles. Socrates sees that state of tension and its concomitant confusions which results from the confronted contradiction as a necessary prerequisite to the subsequent deepening and general enhancement of the level of thought. In his analogy of the cave this is represented by the blindness experienced by the cave dweller when he first emerges into the blinding light of the sun. This first stage of true knowledge is self-conscious ignorance, because such awareness of the inadequacy of present positions is necessary to generate the new organizations and syntheses. Thus it is only through the juxtaposition of differences, the concordance of opposites, that knowledge can be advanced.

It is no coincidence that many of our current theories of cognitive functioning rest upon such a dynamic dialectical model for the acquisition of knowledge. The best example is the cognitive developmental theory of Piaget. He conceives of cognitive development operating through the mutual processes of assimilation and accomodation which are called forth by successive disequilibria and new equilibrations. His *marche a la equilibre* is a 20th century version of Plato's conception of man moving up the divided line via the dialectical experience. Flavell (1963) implies that the child reaching toward the concept of conservation engages in a Hegelian kind of dialectic. (It's taller ... No, it's narrower... It's the same!) It was for Piaget to recognize that this dialectic is not contingent upon the presence of a community gadfly, but rather is implicit in the very nature of the relationship between the evolving, developing organism and the surrounding environment with which he interacts.

The philosopher whose work most directly influenced the present investigation was also clearly dialectical in his development and theorizing. John Dewey was trained in the classical idealism of Hegel and though he became our leading philosophical pragmatist and psychological functionalist he never left behind the dialectical mode of reasoning and theorizing when he changed the substance of his position.

This digression has been for the purpose of identifying the broad relevance of the cognitive shift variable for the understanding of human inquiry. It is of great importance to have identified that the most effective general inquirers are those who can manipulate the sources of information which they have at their disposal in order to maximize the opportunities for juxtaposing different sources. A major difference between these seekers is in their apparent willingness to create within themselves the conditions for the dialectic. The individual who remains within a single source is preventing the dialectic; he who shifts is inviting it.

It is for this reason that a distinction to be made in the next chapter is extremely important. In that chapter we shall distinguish between what we shall term 'surveying' and 'problem solving' sequences, that is, the differences between those sequences of behavior which reflect the individual's seeking out of problems and their solutions and those sequences that are not problem-centered. If it can be identified that such a distinction relates to findings we have heretofore reported, we shall have extended our theory of inquiry even further. At the conclusion of that chapter we shall discuss further the implications of the present findings for our understanding of inquiry processes.

CHAPTER VI

PROCESS ANALYSIS OF INQUIRY PERFORMANCE
PART II. SURVEY AND PROBLEM SOLVING

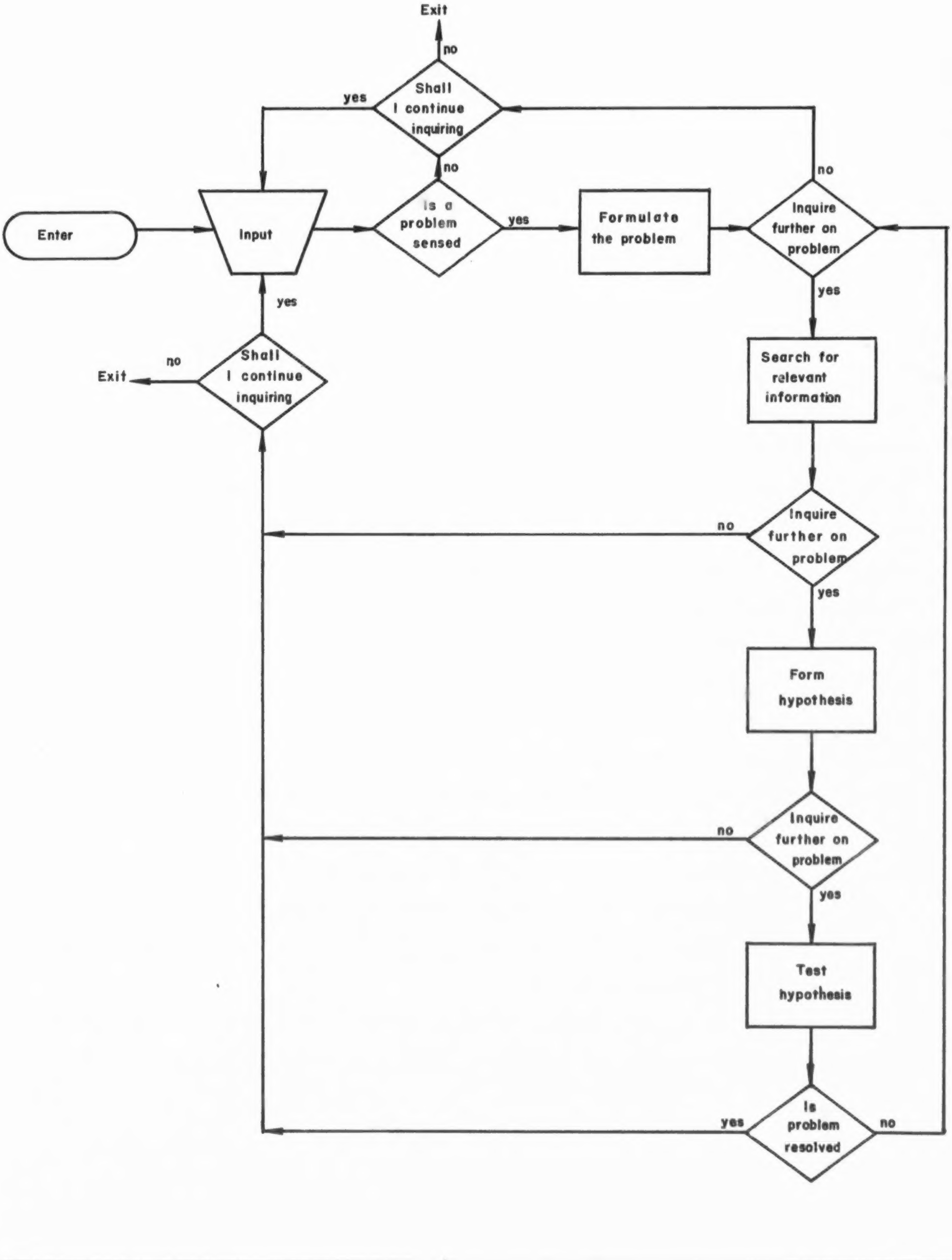
At several points in this report, we have theorized that the process of inquiry consists of four sub-processes: problem sensing, problem formulation, search, and resolution. We have further theorized that these sub-processes are relatively discrete and that they do not usually follow one another exactly in this order. In an attempt to test this theory we first developed some measures designed to identify those basic parameters and their determinants. These were presented in Chapter IV. In Chapter V we presented a further study of the inquiry process, discovering that the successful inquirer engaged extensively in what we call cognitive shifting, in other words, in comparison and contrast among bits of information gathered from a variety of sources. In the present chapter we shall further examine the process of inquiry in hopes of clarifying and expanding upon some of the concepts already developed.

Crucial to an understanding of the activities reported in this chapter is an understanding of what is meant by the terms *problem solving* and *survey*. The flowchart presented in Figure 17 is a schematic representation of inquiry behavior taken from the protocol of one of our video-taped in-basket subjects. The flow-chart should help to clarify these terms.

The process always begins with an encounter involving the input of a bit of information. The first test cell indicates that a binary

FIGURE 17

SIMPLIFIED FLOWCHART OF INQUIRY SEQUENCE EMPHASIZING SURVEYING-PROBLEM SOLVING DISTINCTION


Exit
no
yes
Shall I continue inquiring
no
no
Enter
Input
Is a problem sensed
yes
Formulate the problem
Inquire further on problem
yes
yes
no
Exit
Shall I continue inquiring
Search for relevant information
no
Inquire further on problem
yes
Form hypothesis
no
Inquire further on problem
yes
Test hypothesis
yes
Is problem resolved
no

decision must be made at the point. Either the bit is perceived as being problematic or it is perceived as being non-problematic. If the latter occurs, the inquirer either breaks off inquiry or gets a new bit of information. If, on the other hand, the bit is perceived as being problematic, the inquirer proceeds to the stage of problem formulation. Following formulation (a process about which we unfortunately know little) he makes a decision either to engage in *survey* or in *problem solving*. If he decides to do nothing further with this particular problem, he has returned to surveying. If, on the other hand, he goes on to search for relevant information, to formulate and test hypotheses, he is engaged in problem solving. Note that we perceived the inquirer as having the choice of breaking off the inquiry at any point or of continuing indefinitely.

Study of the protocol on which the flowchart is based suggested the hypothesis that success as an in-basket inquirer is dependent on whether or not one is willing to probe deeply into a problem. To probe deeply would mean that the inquirer, rather than taking the survey loop, would take the problem solving loop, searching for all available information before attempting problem resolution. This notion of a difference between survey and problem solving provides the rationale for the scores on which the analysis for this chapter is based. We now turn to a description of those scores and the manner in which they were generated.

The first score is called Problem Solving Bits. This score is the raw number of materials or bits processed by the inquirer within problem solving sequences as opposed to survey sequences.

The Problem Solving Sequences score is the raw number of problem-solving sequences of length greater than one bit.

The Problem Solving Ratio for any subject is the ratio of number of problem solving bits to total number of bits. For convenience, the resulting fraction is multiplied by one hundred. The score is thus reported as a whole number greater than one and less than one hundred.

Finally we have the score called L-Bar which refers, not to a Texas ranch, but to the mean length (hence *L*) in bits of all problem solving sequences generated by a subject.

These scores are not independent of one another. They were generated on the basis of a simultaneous analysis. They have all been generated to investigate the most effective ways of measuring the problem-solving aspects of inquiry.

Generating these scores involved a rescoring of the protocols. A problem solving sequence was defined as at least two successive bits related to a single problem. All such sequences were counted and tallied on a score sheet according to the number of bits they contained. The number of tallies gave the number of problem solving sequences. The number of problem solving bits was derived by multiplying the size of a sequence by the number of tallies in the category and then summing the products. A sample score sheet is given as Table 33. This table replicates the score sheet of a dialectical, high GPA subject whose protocol is discussed below. Notice that on the score sheet the tallies are made on a two-dimensional grid. On the horizontal dimension we have length of problem solving sequence expressed in terms of numbers of bits, running from two to greater than ten. On the vertical dimension we have three in-basket problem categories, namely, psychologist's list, enrichment and remediation list, and miscellaneous. Since the latter category served as a "wastebasket" function it had serious weaknesses both of reliability and of interpretation. Scores on this dimension were therefore ignored in the analysis. We shall discuss them no further.

In order to provide as clear a picture as possible of how these problem solving scores were derived, we include a portion of a rescored protocol for one of our subjects. This is given as Table 34. The protocol covers about 45 minutes of inquiry engaged in by a dialectical, high GPA subject. During these 45 minutes the subject sensed 52 problems and shifted approximately 75 times. She engaged in 23 problem solving sequences involving a total of 61 bits. Let us see now how these last two scores in particular were derived.

Note first that some of the lines of the log are bracketed. These indicate problem solving sequences. There are 23 such bracketed sequences. The Problem Solving Sequences score for this protocol segment is thus 23.

3

TABLE 33

SAMPLE TALLY SHEET USED IN RESCORING PROTOCOLS FOR PROBLEM SOLVING SCORES

Name ______________________ Student Number ____________________

Group ______________________ I-B __________ Administration ______

I. Inquiry Sequences

	2	3	4	5	6	7	8	9	10	>10	TOTALS Sequences	Bits
Psych. list												
E & R												
Misc.												
Total Sequences												
Total Bits												

Total number inquiry sequences ______________________

Number student-oriented sequences ______________________

Number problem-oriented sequences ______________________

Total number inquiry bits ______________________

Number student-oriented inquiry bits ______________________

Number problem-oriented inquiry bits ______________________

Ratio: Inquiry bits/total bits ______________________

L-Bar ______________________

II. Comments

Second, looking at the bracketed segments in the order in which they appear in the protocol, we note that the first segment is accompanied by a "7" in the right margin. This means that the segment contains seven bits and is consequently referred to as a seven bit problem solving sequence. That there are seven bits can be verified by noting that the subject checks both report cards (two bits), both cardexes (two bits), the map (one bit), and rechecks both cardexes (two bits).

The next four sequences are shoft and involved use of the cardex, report card and/or map.

Following are 15 sequences each consisting of two bits. For each child in the in-basket the subject compares corresponding cardexes and report cards. This is what was earlier called "stitching" behavior, a repetitive kind of cognitive shifting.

The next sequence is three bits long and involves use of a memo, a report card, and a cardex.

Finally, we have two longer sequences. The first of these is initiated by reading the band memo (one bit). This memo instructs the teacher that David Rosen and William Moore are to be excused for band practice at 11:00 A.M. on Tuesdays and Thursdays. The subject then checks the class schedule (one bit) and discovers that band conflicts with math. She then checks Moore's cardex (one bit) and discovers that his past math achievement is low. A glance at Moore's report card (one bit) shows that he is still doing poorly in math. Continuing along this line, the subject checks Rosen's cardex (one bit) and report card (one bit), satisfying herself that he is doing well enough and that his participation in band is not harmful to him. She returns to Moore, reading a letter (one bit) from his mother which expresses her concern over her son's dropping grades. Mrs. Moore asks for a conference with the teacher. The subject concludes that band is interfering with Moore's math performance. She checks the cardex (one bit) to verify Mrs. Moore's occupation and then resolves to set up the requested conference. This concludes the sequence since partial resolution of the original problem has been reached. Also, it is hard to see any logical connection between this sequence and what follows, namely, checking the California Test of Personality.

The last sequence given in Table 34 consists of five bits. It is initiated by the reading of a telephone call slip (one bit). William's mother called to say that they had a cross burned in their front yard, that this is the first problem that has arisen in their integrated neighborhood, etc. The slip does not give the family name of the caller. The subject speculates about who it might be. She checks (one bit) and discovers that there are two Williams in class, Fagen and Moore. A discipline report (one bit) recounts how some children called Mary Beth a "nigger lover" for playing with "William." An earlier investigation had shown that Mary Beth Graves and William Fagen are bother and sister. A check of the sociogram (one bit) shows that Mary Beth chose William Fagen as her first choice. This leads to further speculation about which William, Fagen or Moore is the Negro. A discipline report slip (one bit) involving William Fagen only deepens the mystery and the subject decides to break off any further treatment of this problem at this time. This ends the sequence.

This rather extensive explanation of the way protocols were rescored gives a glimpse into the degree to which scorer judgment influenced the derived scores. Objectivity thus became one of our prime concerns. The two scorers consulted frequently at the beginning to assess the degree to which both of them were scoring identical segments the same way. The degree of agreement in these consultations convinced us that the method was sufficiently objective to continue the analysis. The analysis of scores later reinforced this feeling. The stabilities of the scores, reported in Table 35 show that they are as stable as any of the scores used in the present study (compare this table with Tables 6, 12 and 27).

Correlations of these scores with other process variable scores are given in Table 36. They show clearly that an important dimension of inquiry is being tapped. Problem Solving Bits, Problem Solving Sequences, and Problem Solving Ratio are all highly correlated with other process variables for both first administration and second administration. The highest correlations are between the two measures of cognitive shifting and the Problem Solving Bits measure. Both of

TABLE 34

REPLICA OF A PROTOCOL RESCORED FOR PROBLEM SOLVING

Problem Codes & Time		ACTIVITY Problems Sensed-Inquiry Process)	SOLUTION	GENERAL COMMENTS (Significant Remarks)
9:00		Opened folder--took out R.C.'s and cardexes.		Spoke slowly--mumbled softly
		Looked at map for occupations		
		Looked at Cooper cardex first.		
I 2b		Cooper father farmer/mother teacher.	Compared each cardex with map.	
		Read off grades achievement		
		Cooper cardex		
I 0a	7	Fagen, Graves--brother and sister--saw both cards		
		same signed R.C. (cardex)		
		Map--Same address, live together.		
III 2a		Graves		
II 2e		Mother remarried		
II 0c		Same class--both Fagen and Graves.		
XVII 2d		S.S. scores are different (cardex)		
		Hickman cardex.		
	2	Hoffman cardex--compared with map.		
		Wealthy parents.		
V 2a		Hoffman low achievement--with wealthy parents expect better grades--just society no reason for it.		
	2	Lopez cardex		
VI 0a		migrant--map		
VI 2d		transferred from El Paso		
VI 2f		Father born in Mexico		
		Checked with (map)		
IX 2a		Maloney cardex--father doctor		

TABLE 34 (Cont.)

Problem Codes & Time		ACTIVITY (Problems Sensed-Inquiry Process	SOLUTION	GENERAL COMMENTS (Significant Remarks)
	2	Mayer cardex		
X 2a		Father deceased		
X 2c		Mother works		
X 2e		IQ discrepant with grades and achievement		
9:10		McClusky cardex--looked at achieve		
		Scores--read off parent occupations		Fading out.
	2	Moore cardex and map.		
		Norton cardex		Noticing occupation
XII 0a		principal's son		and address with map.
XIII 2a		Rosen cardex--both parents prof.		
XIII 2b		High IQ		
XIII 2c		High achieve scores		
XIV 3a		Sartiano cardex--noted father occupation--low education.		
XIV 2b		IQ 90		
		Sieminsky cardex		
XV 2a		Father changed jobs often		
XV 2b		Both parents work		
XVI 1c		Counted cardexes 15 kids		
		Class size "hardly probable situation!"		
		Decides to compare R.C. and cardexes.		
	2	McClusky--R.C. and cardex consistent		
	2	Cooper cardex and R.C.		
		IQ not very high "can't count on that though."		
		Alphabetizes report cards.		
	2	Fagen cardex and R.C.		
II 1c		R.C. signed by Graves.		
	2	Hickman R.C. and cardex--are consistent with one another.		

TABLE 34 (Cont.)

Problem Codes & Time		ACTIVITY (Problems Sensed-Inquiry Process)	SOLUTION	GENERAL REMARKS (Significant Remarks)
		Hoffman R.C. and cardex		
V 1c		U in some deportment		
V 1a	2	Poor grades		
V 2b		High IQ		
V 2c		Underachiever		
VI 1a		Lopez R.C. and cardex poor studnet		
	2	Varied grades.		
VII 2c	2	Lyons R.C., cardex "see med. record."		
		Maloney cardex and R.C.		
IX 1b		123 pounds--quite overweight R.C.		Looks for inconsistencies between grades and cardex
	2			
IX		D in phys. ed.--wonder if size poses problems.		
		Mayer cardex and R.C.		
	2	IQ discrepant--grades and achieve.		
X 1a		Excellent student R.C. Mayer		
	2	Moore cardex and R.C.		
XI 1a		Low math grades--others OK		
		McClusky R.C. and cardex		
VIII 1b	2	U+ in neatness		
XII 2a		Norton R.C. cardex--IQ discrepant with grades--		
	2	might be who he is		
		Rosen cardex and R.C.		Very concerned with doing test the "right way." Needs structure
XIII 1b		U in use of time		
	2			
XIII 1c		Small		
		Sartiano cardex and R.C.		
XIV 1b		Low grades		
	2	IQ 90		
XIV 2a		Test scores not more in line with IQ than grades.		

TABLE 34 (Cont.)

Problem Codes & Time		ACTIVITY (Problems Sensed-Inquiry Process)	SOLUTION	GENERAL COMMENTS (Significant Remarks)
9:27		Sieminsky R.C. and cardex		
XV 1a	2	Poor student		Flat affect.
XV 1e		Discrepancy		
XV 1c		U's in self control		
		Looked at calendar		Low voice--hard to understand. Not enthusiastic
		Read directions		
XVI 1a		Looks at map. Variability of background of kids in class.		
		Map--areas A and B are interchanged		
		Read Sieminsky memo--IB		
XV 0a		No permission slip--wonder what's the trouble--3rd form		
	3	Looked at R.C. and cardex--not tardy or absent--U in self control.		
		Looked for parents on cardex--went to something else.		
		Read band memo. Read class schedule.		
XVI 9c		Band kids miss math class IB		
		Wonder how kids are doing? in math.		
XI 2b		Moore--low achieve math		
		Math lowest grade on R.C.		
XI 0d		Moore in band during math test.		
	8	Moore may need tutors--have to do something about it.		
		Rosen R.C. and cardex--wonder if he should be in band? OK.		
		Read letter from Mrs. Moore.		
		"Probably it's band"--low math grade.		

TABLE 34 (Cont.)

Problem Codes & Time	ACTIVITY (Problems Sensed-Inquiry Process)	SOLUTION	GENERAL COMMENTS (Significant Remarks)
	Does Mrs. M. work? Looked at cardex--she'd be at home--housewife.	I'll call her.	
No score	E--Call Mrs. Moore for appt.		
	Looked at CTP		
	Read William memo--cross burned		
	Wm. Moore?		
XVI 1d	Neighborhood integrated		
XI	A Negro? Moore?		
	How many Williams are there?		
XVI 7a	2 Williams		
	Read discipline slips--		
9:41	"Nigger Lover"--wonder what I missed here. Thinks Fagen but Graves and Fagen brother and sister, so		
	5 confused.		
	Wm. Moore? is it him?		
	Good friend of Wm. Wm. must be a Negro. Graves and Fagen Stepbrother and sister. I wonder if he (Fagen) is the Negro.		
III 8a	Relationship with Negro.		
	Read Fagen discipline slip beat up Terry.		
	Wm. beat up Terry. Wait on that--	Set aside	

TABLE 35

STABILITY COEFFICIENTS FOR PROBLEM SOLVING VARIABLES BETWEEN ADMINISTRATION ONE AND TWO, YEAR TWO (N=46)

Variable	Stability
Problem Solving Bits	.53
Problem Solving Sequences	.35
Problem Solving Ratio	.43
L-Bar	.46

these types of measures are highly correlated with problem sensitivity. This strongly suggests that the psychological activity of problem-solving as here defined is rooted in the process of cognitive shifting.

Putting these data together, we get an interesting picture of the effective in-basket inquirer. First, he is highly sensitive to the problematic situations which confront him. Second, when he senses a problem, he spends a relatively large amount of his time in problem solving as opposed to survey. Finally, within his problem solving sequences, he makes use of a variety of sources of information. In all these respects he exceeds the performance of his less effective counterpart. Given that this is true the rather high correlations of the problem solving variables with the other process variables are not surprising.

It is interesting to note that when one compares the four measures of problem solving behavior with one another, it is generally Problem Solving Bits that is most highly correlated with the other process variables for both Administration I and Administration II. This indicates that the person who spends the most time in problem solving behavior, as opposed to survey behavior, is the person who will likely sense the most problems and be most competent in problem resolution. It is not then a matter of the number of problem solving

TABLE 36

CORRELATIONS AMONG PROBLEM SOLVING VARIABLES AND OTHER PROCESS VARIABLES, ADMINISTRATIONS ONE AND TWO (N=46), YEAR TWO[a]

Inquiry Variable	Problem Solving Bits		Problem Solving Sequences		Problem Solving Ratio		L-Bar	
Administration	1	2	1	2	1	2	1	2
Competence	55	35	34	14	47	28	30	36
Problem Sensitivity	71	60	54	31	57	44	17	50
Shifts	95	93	80	81	71	56	27	32
Corrected Shifts	92	93	72	66	71	62	35	49
Shift Ratio	77	67	72	72	62	37	13	05
Corrected Shift Ratio	77	73	65	61	64	44	22	24
Bits	58	60	57	51	10	00	03	18
Sources	62	67	50	49	45	49	13	38
General Inquiry	73	62	54	34	57	47	23	50
Time	61	67	42	37	45	55	32	56

[a] For N=46, the probability of a correlation of .29 occurring by chance is $\leq .05$; the probability of a correlation of .35 is $\leq .01$. (two-tailed tests)

sequences engaged in, or the number of problem solving bits relative to total number of bits, or the average length of problem solving sequences that is most indicative of successful inquiry, but simply the absolute number of bits of information processed *within problem solving sequences*.

We turn for a moment to compare this information with the performances of the four groups chosen on the basis of GPA and seeking style. Figure 18 shows that for both administrations, dialectical subjects were high in Problem Solving Bits while didactic subjects were low. The analysis of variance in Table 37 shows that the differences among means for these two groups of subjects are significant. This serves further to reinforce the notion that differences in seeking predispositions play an important role in inquiry behavior.

The moderate to low correlations between mean length of problem solving sequences (L-Bar) and other process variables need some interpretation. Our original expectation was that these correlations would be higher. Later, as we were scoring the protocols, it became clear that "noise" would be introduced into the measure by those subjects who were low in problem sensitivity and who engaged in one or a few inordinately long sequences. Such sequences were characterized by much perseverative behavior. These subjects occasionally and, seemingly ineffectually looked again and again at the same bits of information before terminating given sequences. Such long sequences, when included in the total score, made the mean sequence length of some ineffective inquirers look about the same as effective ones. Nevertheless, sequence length is of some importance. That this is true is shown in Figure 19 and Table 38. There we see that there is a significant interaction between seeking style and GPA for L-Bar on both Administrations I and II. Both times the Dialectical-high GPA group generated significantly longer problem solving sequences than the other three groups. This gives some evidence in favor of our expectation that better inquirers will generate longer problem solving sequences on the average. It also may reflect the fact that to pursue a long and productive problem solving sequence requires both sensitive openness and competence. One without the other may not be adequate for extensive problem solving.

What can we now say about inquiry on the basis of these process analyses? First, survey is one of two important components of the in-basket inquiry process. It is something which all inquirers do. The subjects in the present study spent between 31% and 95% of their time in this activity for the first administration, and between 32% and 91% for the second administration. Means and standard deviations for these

TABLE 37

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF PROBLEM SOLVING BITS SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	97.58 (36.23)	60.33 (31.06)	81.67 (32.01)	54.00 (16.96)
Low GPA	73.78 (30.05)	64.46 (26.62)	77.22 (47.57)	60.38 (37.39)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	6113.36	6.30	.016	.08	1	5583.95	4.76	.035	.01
GPA	1	1091.62	1.12	.295	.18	1	10.61	.01	.925	.11
Interaction	1	2199.87	2.27	.140	.15	1	330.61	.28	.598	.10
Error	42	40776.93				42	49307.30			

R^2 full = .20

R^2 full = .11

TABLE 38

TWO-WAY FACTORIAL CLASSIFICATION AND ANALYSIS OF VARIANCE OF L-BAR SCORES FOR ADMINISTRATIONS ONE AND TWO, YEAR II (N=46)

	Administration 1		Administration 2	
	Dialectical	Didactic	Dialectical	Didactic
High GPA	4.07 (1.33)	3.36 (.79)	4.39 (1.68)	3.06 (1.06)
Low GPA	3.16 (1.29)	3.50 (1.14)	3.22 (1.23)	3.52 (1.16)

Analysis of Variance

	Administration 1					Administration 2				
Source	df	MS	F	p	R^2 Res.	df	MS	F	p	R^2 Res.
Seeking Style	1	.37	.31	.582	.08	1	3.01	1.76	.191	.11
GPA	1	1.67	1.38	.248	.06	1	1.42	.83	.367	.13
Interaction	1	3.18	2.62	.113	.03	1	7.40	4.34	.043	.06
Error	42	51.03				42	71.65			

R^2 full = .09

R^2 full = .15

scores appear in Table 39. In general, the best inquirers spent proportionally less time in this activity than did the poor inquirers.

TABLE 39

MEANS AND STANDARD DEVIATIONS OF PROBLEM SOLVING VARIABLES FOR FIRST ADMINISTRATION AND SECOND ADMINISTRATION

	First Administration		Second Administration	
	Mean	SD	Mean	SD
Problem Solving Bits	73.85	33.62	67.57	35.09
Problem Solving Sequences	21.59	10.32	19.54	10.04
Problem Solving Ratio	35.09	14.16	39.37	14.57
L-Bar	3.55	1.12	3.57	1.37

It may be that survey for a good inquirer plays a psychologically different role than survey for a poor inquirer. Our intensive scanning of protocols left us with the distinct impression that survey for the poor inquirer involved an ineffective "spinning of one's wheels," while for the good inquirer, it involved the kind of fruitful playfulness and curiosity described in an earlier chapter.

It will be recalled that while Problem-Solving Bits distinguished between dialectical and didactic seekers, Problem-Solving Ratio did not. We know that dialectical subjects spend more time and process more bits than do didactic seekers overall. Let us imagine two hypothetical inquirers: Subject A has a total of 300 bits 45% of which are surveying bits, while Subject B totals 220 bits, of which 65% are surveying. It is accurate to observe that Subject B surveys proportionally more than

FIGURE 18

MEAN PROBLEM SOLVING BITS
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II

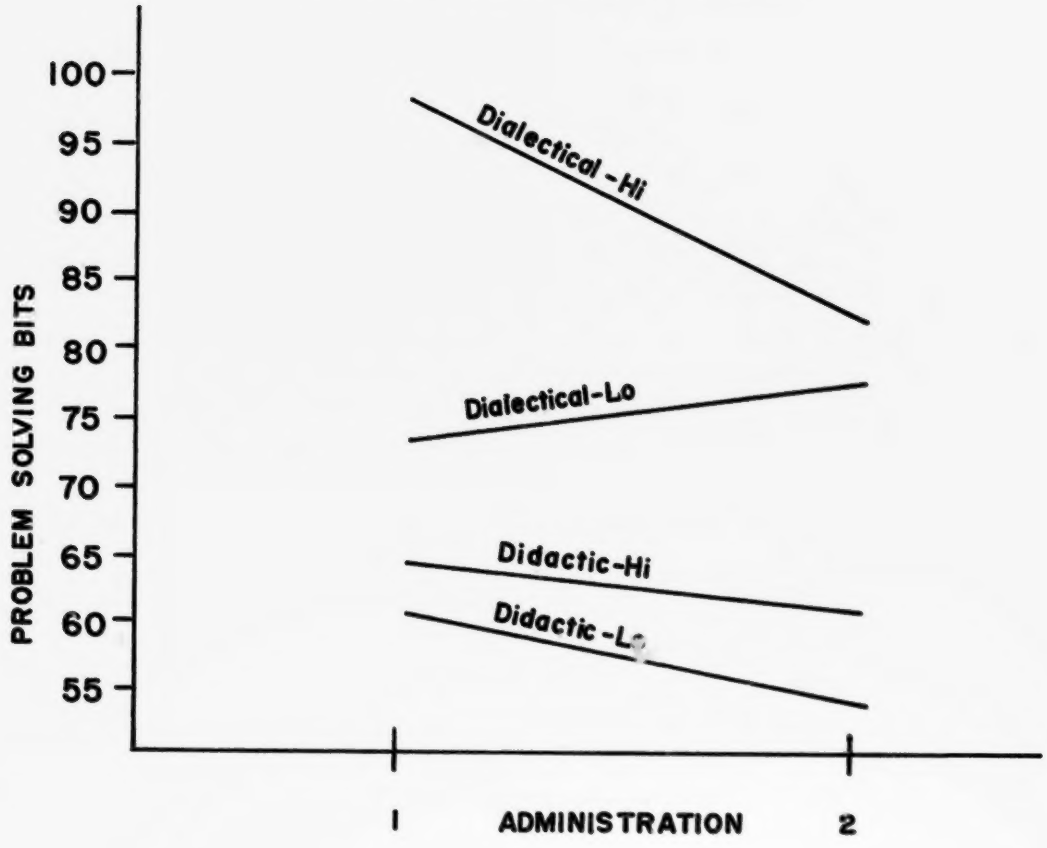
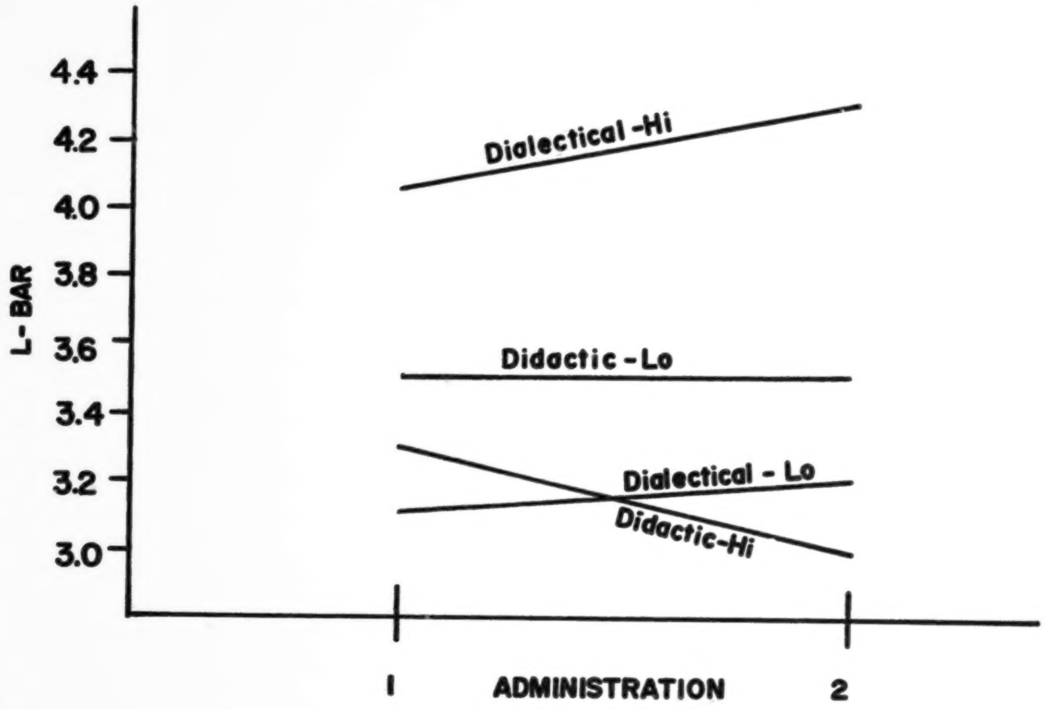


FIGURE 19

MEAN L-BAR SCORES
OF FOUR SUBJECT GROUPS
FOR ADMINISTRATIONS I AND II



Subject A. However, Subject A surveys for a raw total of 135 bits while Subject B's raw surveying total is practically identical at 143.

We are attempting to demonstrate that since competent inquirers spend more time in inquiry they probably survey *as much* as do poor inquirers while problem-solving much more. We would speculate that whereas surveying serves as a problem solving-substitute for poor inquirers, it is a propadeutic to and exploratory diversion from inquiry for effective inquirers.

We turn now to a further characterization of the in-basket problem solving process. We have noted that successful inquirers as contrasted with unsuccessful inquirers have a higher degree of problem sensitivity, engage in more problem solving as compared to survey activity, and consult a greater number of sources of information. The question now is this: What kinds of strategies do inquirers use as they go about solving problems? There seem to be at least three. None of them is used exclusively by any one person.

The first is a grouping strategy which involves putting material related to a particular problem together in one place. We shall suppose, for example, that the inquirer has encountered a memo from the school nurse that says that one Stu Sieminsky has a bruise on his right arm, that it looks as if he had been beaten. We shall further assume that the inquirer has sensed this as a problem and that he has decided to continue inquiry on this problem. If this is the situation and if he is using the grouping strategy under discussion here, the inquirer will then go about gathering together some of the following items: Stu's report card, cardex, and cumulative folder, medical report, discipline report slips, anecdotes, California Test of Personality score, sociogram, map of the community, etc. Once the relevant materials are gathered together, the inquirer will carry out a thorough investigation of the sensed problem. In practice inquirers seldom gather together *all* possible sources of information into one array to bring them to bear on a problem. It is quite common though for an inquirer using this strategy to gather information from four or five sources, and to use it in problem solution. When he does this, he is involved in what we have called problem solving.

A second strategy also involves grouping but in a different way. Materials are scanned successively. The inquirer writes on appropriate pieces of paper those bits of information which are relevant to a particular in-basket problem. Such slips of paper are often headed with a student's name. For example, the inquirer who uses this strategy and who encounters the nurse's memo regarding Stu Sieminsky will get a piece of paper, entitle it "Stu," and then write down that he is bruised on the right arm, that the bruise may be due to a beating. The inquirer will then go on with other memos. Then later, when he is going through report cards and comes across that for Stu Sieminsky, he may jot down on the paper headed "Stu" that most of Stu's grades are low and that his deportment is unsatisfactory in some areas. This process may go on for some time until the inquirer has extensive, even complete, notes on each problem area.

This particular strategy is hard to evaluate. Its effects have not yet been systematically analyzed. The analysis of our data is to this extent incomplete. We have available all the notes which were made by our subjects so such an analysis can be done in the future.

There is yet a third way of grouping related bits of information, namely, grouping in memory. Evidence for this comes from those cases in the protocols when a subject senses a problem in a source to which he is attending and then in his verbalizing recalls a related bit of information which was encountered previously in some other source. We suppose that this grouping strategy is somewhat less efficient than the others since interference prevents the recall of all the pertinent details which have been attended to and which are assumed to have passed into memory.

These then are some of the identifiable strategies available in the service of problem solving as it is observed in the Teacher's In-basket. From the standpoint of efficiency it seems that the first strategy is the best. In comparison with grouping in memory, it provides a maximum amount of information while reducing the load on memory. In comparison with grouping on written notes, it eliminates spending time in the mechanics of writing while providing equal or greater amounts of information.

This brings us to the final stage, that of a tentative specification of an optimal Teacher's In-basket inquiry strategy. Once again, this is developed partly out of analyzed data and partly out of notions derived from the process of scoring the protocols.

First, the inquirer should do a complete job of initial orientation surveying, finding out what tasks must be done and what materials are available to work with.

Second, the inquirer should group materials efficiently. This makes it possible to juxtapose a variety of sources, basing the problem resolution on a maximum amount of information.

Third, the inquirer should spend as much time as practicable in problem solving. Perhaps a 50-50 balance between surveying and problem solving would be nearly optimal.

Finally, within any one problem solving sequence the inquirer should spend only as much time as it takes to get relevant information without being redundant. The best inquirers do not perseverate once they have begun a problem solving sequence. Often for them, a two-bit sequence is sufficient to reach solution. They only generate longer sequences as it becomes necessary.

Summary

At several points in the discussion of the process analyses, we have spoken of the successful in-basket inquirer, success being defined in terms of high scores on Problem Sensitivity, Competence, and Information Sources. We have asked how the *process* of inquiry relates to success in inquiry. We have developed two separate analyses of the process in order to answer this question. These analyses have resulted in the development of three basic concepts, cognitive shifting, survey, and problem solving, all of which are viewed as integral parts of the inquiry process. These concepts give us a new way of characterizing the successful in-basket inquirer, something to which we now turn.

First, the effective inquirer engages in the cognitive shifting more than his less effective counterpart. This is seen as primarily a function of his willingness, even desire, to encounter and deal with the discrepant. It is only secondarily a function of the way he uses his available time.

Second, while the effective inquirer does engage in survey, he spends relatively less time in this activity than does the less effective inquirer. 50% of the available time spent in survey is about optimal. During this time the effective inquirer makes himself aware of what is to be done. At the same time, he is storing away information which may later be useful for solving problems.

Third, the successful inquirer spends more time in problem solving. Like cognitive shifting, this is largely a function of a willingness to enter deeply into problematic situations.

It was not simply that the effective inquirer used more time generally, though this he did. He used his time to increase his encounters with the objects of inquiry--problems. Could ineffective inquirers be rendered more effective merely by causing them to spend more time with inquiry materials? Ultimately this is an empirical question, rather easily studied experimentally. Our expectation is that forced increases in time alone would not suffice. Merely leaving a camera's shutter open without effecting appropriate internal adjustments simultaneously does not result in sharper pictures, but in unsatisfactory overexposures.

In these two chapters on process analysis we have attempted to extend our understanding of the components of inquiry through intensive reanalysis of inquiry protocols. New analytic constructs such as cognitive shifts and problem-solving sequences have helped us to answer the question of what an effective inquirer *does* that distinguishes him from his less effective peer. We ended Chapter IV with the questions What do effective inquirers do? and How do they spend their additional inquiry time? We have now provided some answers to those questions.

Before moving on to a general discussion of our findings and their implications we shall examine two additional aspects of the present research. In Chapter VII we shall review the findings concerning the congruence between student and supervising teachers and its relevance for subsequent changes in inquiry. In Chapter VIII the data for conceptual tempo are related to inquiry behavior. The final two chapters of this volume will discuss the meaning of our research and the implications of these studies for research in cognitive processes and for the development of a theory of inquiry.

CHAPTER VII

THE EFFECT OF STUDENT TEACHING ON INQUIRY

The purpose of this Chapter will be to explore the relationships between inquiry behavior and teaching, first in terms of the modifiability of inquiry behavior as a function of student teaching experience and second in terms of the influence of seeking style and inquiry behavior on teaching itself.

All subjects took part in student teaching during the ten-week winter quarter of 1967, which intervened between their first and second administration of the Teachers In-basket. It was felt that their different student teaching experiences might well have differential influences on their subsequent in-basket performance. Although it was impossible to observe each student teacher with her supervising teacher directly, we attempted to describe the student teacher-supervising teacher "fit" in terms of the set of tests which we previously had employed to predict the student teachers' seeking styles. The supervising teacher's ratings of her student teacher were also obtained. Finally, subsequent to the student teaching experience, subjects were administered an alternate form of the Teachers In-basket. Changes in inquiry behavior were indicated by changes in performance on the in-basket.

During the Winter Term of 1967, while our subjects were student-teaching, a battery of tests was mailed out to the various student-teacher coordinators for administration to the supervising teachers. Forty supervising teachers whose student teachers were not participating in this study were also tested to avoid calling inordinate attention to our subjects. They were informed that a study of the characteristics of supervising teachers was underway. The measures obtained through the battery included Complexity, Lecture Discussion, Inventory of Beliefs, Word Association and Closure Flexibility. It will be recalled that these five measures plus a sixth, Syllogism-Risk, formed the basis for prediction of dialectical or didactic seeking styles. It was impossible to administer the Syllogism-Risk test appropriately to the supervising teachers so, in order to generate a seeking styles predictor score, the Politics scale was added to the teacher test battery. Politics was previously found to be highly effective in distinguishing dialectic-didactic seeking styles. In addition to these six scales central to prediction of seeking style, the battery included the Focus-Scan scale, the Education scale (pupil orientation or subject-matter orientation), and a measure of socio-economic status. Forty-six of the 56 supervising teachers completed the above battery. In addition, 35 supervising teachers made available their ratings of their student-teacher's performance in the classroom. Of course, since our research staff remained purposely ignorant of the group membership of specific subjects until all data were collected, no attempt at matching subjects to supervisors was attempted.

In order to interpret these data more easily, all comparable scores for the subject group were standardized to a scale having a mean of 50 and a standard deviation of 10. The scores of the supervising teachers on the above nine scales were normed to the distribution of the student teachers. Thus students and teachers having identical raw scores would likewise have identical standard scores. The six above mentioned scales which were hypothesized to be related to seeking-style were summed separately for each student and each supervising teacher yielding for each individual a pooled predictor score of dialectical-didactic seeking style. Since it was the summation of six T-scores, it averaged approximately 300. Data analysis was accomplished by subtracting the supervising teacher's scores on the test battery from the test scores of her particular student teacher. The remainder which could be a positive or a negative number, was the student teacher-supervisor difference score. A correlation matrix was generated between the students' scores, the supervising teachers' scores, the difference scores, and the change scores in in-basket inquiry behavior between first and second administration of the teacher's in-basket. Since the General Inquiry score was the most general summary measure of inquiry behavior (see Chapter IV) it was used as the indicator of in-basket performance and inquiry behavior.

The first finding was that the students' scores on the test battery were quite independent of the scores for their supervising teachers. Evidently the process by which student-teachers were ostensibly matched to their supervisors in order to enhance the student-teaching experience was unrelated to the kinds of seeking style determinants of interest to this report. The correlation between student-teacher and supervising-teacher on the seeking style predictor score was exactly .00.

The student teachers and their supervisors differed on a number of the above measures. Table 40 reports that the supervising teachers tended to be more stereopathic in their beliefs than the student teachers. They also showed greater fluency in word associations. The supervisors were more conservative in their politics than the student teachers. They perceived themselves as being scanners and subject-matter oriented when compared with the means of the student teachers. Finally the socioeconomic status of the backgrounds of supervising teachers was considerably lower than that of the student teachers. Thus, although the student teachers and supervising teachers were very similar in terms of the overall dialectical-didactic score, they tended to differ on the component measures and other measures related to inquiry. These findings are consonant with the general observation that experienced teachers tend to be more conservative than neophytes and are more subject-matter oriented. We had not expected to find the students coming from higher social-class levels.

TABLE 40

MEAN SCORES AND STANDARD DEVIATIONS ON 10 VARIABLES FOR STUDENT TEACHERS AND SUPERVISING TEACHERS, (N=46)

	Student		Teacher	
	Mean	S.D.	Mean	S.D.
Complexity	50.2	(10.6)	50.6	(8.8)
Lecture-Discussion	49.6	(10.5)	50.3	(8.1)
Inventory of Beliefs	49.4	(10.3)	42.8	(13.3)
Word Associations	48.6	(9.1)	56.4	(15.4)
Closure-Flexibility	49.5	(9.2)	49.6	(12.4)
Politics	49.3	(10.6)	47.4	(10.2)
Focus-Scan	49.6	(9.8)	54.8	(9.8)
Education Scale	50.4	(10.6)	56.6	(14.4)
Social Class	50.3	(9.5)	43.5	(7.6)
Seeking Style (summation of first six scores above)	295.7	(40)	297.3	(34)

Inspection of Table 41 shows that, in general, differences between the student-teacher and her supervising teacher on individual tests were unrelated to the more microscopic indices of inquiry behavior such as changes in the amount of cognitive shifting. This is not surprising, however, since the influence of these cognitive differences would indeed be powerful if they found individual manifestation in the small components of inquiry. However, when these cognitive differences are pooled, as in the difference between the pooled seeking-style predictor scores for the student-teacher and her supervising teacher, the cognitive differences begin to show an influence on our more general measures of inquiry behavior. The correlations between student teacher-supervising teacher differences and the overall measures of inquiry indicate a definite relationship. Thus, the greater the positive difference between student and supervisor (student higher), the greater the positive change in general inquiry and problem sensitivity. Changes in competence and sources also tend in the same direction.

TABLE 41

CORRELATIONS BETWEEN DIALECTICAL-DIDACTIC PREDICTOR SCORES AND CHANGES IN INQUIRY FROM ADMINISTRATION I TO II, N=46[a]

Change Scores	Seeking Style Predisposition		
	Student Teacher	Supervisor	Student-Supervisor Difference
General Inquiry	28	-15	31
Competence	25	-01	19
Problem Sensitivity	27	-19	34
Information Sources	17	-07	18
Shifts	-04	-01	-03
Corrected Shifts	-10	-03	-05
Time	10	03	07
Bits	11	-11	15
Shift Ratio	-14	01	-11
Corrected Shift Ratio	-13	-06	-06

[a] For N=46, the probability that $r \geq .25$ will occur by chance = .10, p $(r \geq .29) = .05$, p $(r \geq 35) = .01$.

One should especially note that interpretation of any relationships with these difference scores are somewhat speculative because the difference scores necessarily include the student teacher's initial status. However, it is possible to estimate the contribution of the interaction over and above the student's initial status by noting that the correlations with the student teacher-supervisor difference scores are not identical to the correlations with the student teacher scores alone. This indicates that not only was the student's seeking style related to change in inquiry behavior, but likewise the nature of her ten-week interaction with her supervising teacher influenced her subsequent inquiry behavior. In particular, when a student teacher was more dialectical than her supervising teacher, she tended on subsequent testing to be more problem sensitive and her general inquiry score tended to be higher. Conversely the student teacher who was less dialectical and, therefore, more didactic than her supervisor, tended to be less problem sensitive and have a lower general inquiry score. It must be remembered that the above interpretation is based on small changes in small correlations and may well not be reliable; however, the pattern seems to have at least heuristic value.

Table 42 represents a way of looking more closely at the dynamics of changes in general inquiry. Student teachers and their supervising teachers were classified as either high, moderate, or low on the dialectical-didactic predictor score (high = dialectical). Deviation of ± 20 score units from the mean score was considered as the criterion for assignment to one or another of the polar classifications. The ± 20 point cut-off was selected arbitrarily to divide the student teachers and supervising teachers into three approximately equal groups that would represent very roughly our conceptions of the dialectical and didactic typologies and a third group, difficult to classify directly, which falls at the midpoint of the continuum. These categories were used to generate a 3x3 classification in which were inserted the mean general inquiry change scores for each of the resultant nine subgroups.

TABLE 42

MEAN CHANGE IN GENERAL INQUIRY CLASSIFIED BY STUDENT-TEACHER AND SUPERVISING TEACHER SCORES ON THE SEEKING STYLE PREDICTOR

			Supervising Teacher			
			L	M	H	
Student Teacher	L	$\bar{x}$	-5.3	-6.9	-29.5	-11.2
		n	6	9	4	19
	M	$\bar{x}$	14.3	-2.2	-17.3	-1.8
		n	3	5	3	11
	H	$\bar{x}$	6.9	-14	15.5	2.5
		n	7	5	4	16
		$\bar{x}$	3.7	-7.5	-9.8	-4.17
		n	16	19	11	46

The table reveals two interesting trends which will be discussed simply as trends without reference to statistical test because of the large variance and small sample size in each cell. First, as the subjects became more dialectical, the mean change score in general inquiry moved in a positive direction confirming the earlier observation that dialectical seeking style was related to a positive change in general inquiry. Further, as the teacher seeking style became more dialectical, the student teacher's change in general inquiry tended toward the negative direction.

The above two general trends, however, were not independent but interacted in an interesting manner to effect a change in the inquiry behavior of the student teacher. Within the group characterized by student teachers and their supervisors scoring high, or dialectical, on the seeking style predictor, we found the greatest positive change in general inquiry. Evidently this interaction was particularly conducive to development of inquiry behavior. Conversely, when a student teacher was paired with a supervisor more dialectical than herself, her general inquiry behavior changed drastically in a negative direction.

The subjects in these two groups of students paired with more dialectical teachers displayed greater negative change in inquiry behavior than any other group. The interactions with teachers having moderate seeking style scores, i.e., those teachers difficult to classify as either dialectical or didactic, produced uniformly negative changes in their student-teachers' subsequent inquiry behavior. Surprisingly, strong positive change in inquiry took place with girls who student taught under clearly didactic supervisors. The exceptions to this were the didactic student teachers paired with didactic supervisors. Their inquiry scores dropped, although only slightly, from Administration I to Administration II.

These results are for the most part tentative and unreplicated. We therefore feel it especially important to attempt a brief explanation in terms of an established theoretical framework. Such an explanation can be heuristically valuable in stimulating and guiding future research to explore our findings in depth. It appears that the dynamics of the student teacher--supervising teacher interaction can be interpreted in terms of the theory of cognitive dissonance (Festinger, 1957). When a student teacher was matched with a dialectical or didactic supervising teacher and was congruent with the supervisor's seeking style, the student teacher's seeking style was reinforced; her subsequent inquiry behavior changed in the predicted direction. If, on the other hand, the matching was other than congruent, the subsequent change in inquiry behavior was strong in the direction opposite that indicated by the supervisor's seeking style. We would propose that the incongruence between student teacher and supervisor resulted in a state of cognitive dissonance since the supervising teacher represented a model figure manifesting incongruent characteristics for the student. Dissonance can be resolved by cognitive change, either in the direction of the model, thus decreasing the conflict, or in the opposite direction, reinforcing one's own beliefs and thus effectively balancing and rejecting those in opposition. The latter alternative appears to have occurred within our group of subjects.

Since what we have been calling dialectical or didactic seeking styles in reality do not define a continuum but are two discrete typologies, the interactions with those teachers having moderate seeking style predictor scores cannot be properly interpreted. Presumably, some may be dialectical or didactic, or some may fit neither description since we consider these as discrete types. However, our instruments are not sensitive enough to make such fine discriminations.

It is the position of the authors that a teacher with a dialectical seeking style is of value to education (see discussion below) and that as such, imparting of dialectical characteristics should be a goal of teacher training. The above results suggest the importance of careful matching of student teacher and supervising teacher, but not merely to maximize some sort of global personality congruence. This is often the announced goal of student teaching assignments. If the present findings are any indication, this goal is not met with notable success. Instead, the purpose should be to maximize the congruence or incongruence in a manner which would result in a dialectical shift in the student teacher's inquiry style. For example, in the case where the supervising teacher is dialectical an appropriate matching would be with an already dialectical student teacher; other matchings with the teacher might more likely result in a didactic shift in the student teacher's behavior. It would be inappropriate to the goal of fostering dialectical seeking styles to match a didactic student teacher with a didactic supervisor since this pairing seems to foster didactic seeking. These results give no clue as to how one brings about a dialectical shift in seeking styles except in those cases where the student teacher already seems to favor a dialectical mode of inquiry, or at least does not favor a didactic mode. Hence, they offer no help with the majority of our cases. We can surely conclude that in general student teaching *per se* does not significantly modify the inquiry behavior of student teachers in a dialectical direction. The problem of trainability of inquiry behavior was not directly explored in this research project, however it is the principal aim of a forthcoming research endeavor discussed in Chapter IX.

Student Teacher Ratings

As was previously mentioned, in addition to the test battery administered to the supervising teachers, we had the opportunity to collect data on the supervising teacher's rating of her student teacher. Since it is our belief that inquiry and teaching are closely related, it was not surprising to find that those factors describing the student teacher-supervising teacher interaction which influenced changes in inquiry behavior also were related to the student teacher ratings. Thus there were some parallels between student teachers ratings and changes in general inquiry.

Before these results can be discussed it must be emphasized that the ratings were probably highly unreliable. The rating form consisted of a series of 10 point scales ranging from "unsatisfactory student teaching performances" (1), to "well prepared to begin teaching . . ." (5) to "a performance rarely seen in student teachers . . ." (10). If the scale were properly used one would expect a group of student teachers to have a mean rating of about 5. However the mean rating of our group was 7.3 with a standard deviation of 1.5. Either these were exceptional student teachers or, more likely, their supervisors felt compelled to rate them within a more socially acceptable range, namely 5-10. This should be kept in mind throughout the section dealing with ratings and all interpretations must be regarded accordingly.

Three scores were extracted from the rating forms to accomplish the analysis. The first score was the supervising teacher's overall rating of the student teacher on her general effectiveness as a teacher. The second score is the summation of three subscores rating the student teacher on her flexibility in meeting, and using to an advantage,

TABLE 43

CORRELATIONS BETWEEN STUDENT TEACHER--SUPERVISING TEACHER DIFFERENCES ON TEST BATTERY AND STUDENT TEACHER RATINGS AND CHANGES IN GENERAL INQUIRY

	Student minus Teacher Score	General Rating	Flexibility Rating	Total[b] Rating	Change in[a] General Inquiry
D	Complexity[c]	10	08	08	08
D	Lecture-Discussion	23	16	24	-18
D	Inventory of Belief	31	28	28	15
D	Word Association	32	43	36	17
D	Closure-Flexibility	20	13	16	21
D	Politics	26	14	22	30
D	Focus Scan	15	27	17	00
D	Education Scale	-34	-40	-41	06
D	Social Class	-07	-13	-09	00
	Student Seeking Style	34	34	30	28
	Teacher Seeking Style	-25	-17	-26	-15
D	Seeking Style	41	37	39	31
	Change in General Inquiry	11	-03	05	17
	Student GPA	34	29	31	

[a] N=46

[b] N=34

[c] D indicates that the correlations are with the difference scores resulting from subtracting the supervising teacher's score from the student teacher's score.

unusual or unexpected situations. The third score was generated by simply summing over the total scores for the seven sub-categories on the rating form, e.g., working with people planning for instruction, command of subject and teaching materials, etc. Since the intercorrelations among these three ratings scores were so high (.92 - .97) only the total rating score will be discussed.

As was predicted, the supervisors rating of the student teacher was related to the nature of the student teacher--supervising teacher interaction. Further, this relationship appeared greater than the relationship of the interaction to subsequent changes in inquiry behavior. Table 43 reveals that the student teachers' scores on the dialectical-didactic seeking style variables were significantly related to their ratings as student teachers. The direction of the correlations indicates that dialectical seeking style was related to high student teacher ratings and didactic seeking style was related to low ratings thus affording some support to our position that dialectical inquiry is important to teaching. The opposite trend is apparent with the supervising teachers' seeking styles although the correlations are not significant. Combining the scores of student teachers and supervisors in the difference scores that we have used to describe their interaction, we find that the greater the disparity between student teacher and supervisor in the direction of the student teacher being more dialectical, the higher the student teacher's ratings from that supervisor.

Whereas in the above section we found a dissonance principle to be descriptive of the dynamics of student teacher change in general inquiry, comparisons of Tables 40 and 43 indicate that student teacher ratings seem to have been assigned on a more direct basis. The supervising teachers seemed to perceive those qualities we had hypothesized as related to good inquiry as qualities desirable for a teacher to possess. Notice that the supervisors had a mean score approximately equal to those of the student teachers on lecture-discussion (Table 40). The supervising teachers were more stereopathic (Inventory of Beliefs) and more subject-matter centered than the student teachers as a group. Yet in Table 43 we note that high ratings were given to student teachers who exceeded their supervising teacher in preference for discussion, non-stereopathy and student rather than subject matter orientation.

Table 44

MEAN STUDENT TEACHER RATING CLASSIFIED BY STUDENT TEACHER AND SUPERVISING TEACHER SCORES ON THE SEEKING STYLE PREDICTOR

		Supervising Teacher			
		L	M	H	
L	$\bar{x}$	50.7	51.8	48.5	50.2
	n	6	6	2	14
M	$\bar{x}$	63	46	44.3	49.3
	n	2	5	3	10
H	$\bar{x}$	58	58.7	57	58.2
	n	6	3	2	11
	$\bar{x}$	55.7	51.2	49.7	52.5
	n	14	14	7	35

Table 44 is exactly analogous to the 3x3 grouping discussed in the above section on changes in inquiry behavior. The dependent variable in this case is the mean student teacher total rating for each particular cross-classification. The trends indicated by the 3x3 table confirm the directional relationships in the correlating matrix (Table 43). The more dialectical the student teacher appeared on the test battery, the higher were the student teacher ratings she received. Conversely, the more didactic the supervising teacher appeared, the higher the ratings she gave her student teacher. Closer inspection of the table reveals that the dialectical student teachers received what appear to be uniformly high ratings. The ratings received by the student teachers with moderate scores on the seeking style predictor are difficult to interpret. These subjects are not readily classifiable as either dialectical or didactic and thus it is difficult to account for the wide range of the mean scores for these groups.

From the above analysis one would expect that student teacher ratings would be correlated with the direction and magnitude of change in inquiry behavior over time. However, Table 43 indicates that they are unrelated; the correlation between the two is -.05. This result was intuitively inconsistent since both change in general inquiry and student teacher ratings were related to the student teacher-supervising teacher interaction in a strikingly similar manner. It was felt that if within-group variation were eliminated, the correlation might be statistically visible. The mean scores for change in general inquiry and student teacher ratings of the nine groups in the 3x3 classification were therefore ranked and the ranks of the group means were correlated. The rank order correlation between average group (within the 3x3 Table) change in general inquiry and the supervising teacher's average total rating of her student teacher was .65.

If, for a moment, we consider these nine groups to be relatively discrete in terms of the type of interpersonal interaction represented, and further consider the group means as representative of the individuals within each group, we might speculate about the indirect relationship between student teacher ratings and changes in inquiry behavior. In other words, if these groups represent non-overlapping states of affairs, then the mean scores might well be representative of the group members. In such a case, the .65 rank correlation might be representative of the true case since it eliminates the within group variation presumably due to measurement error. In the ideal situation we would expect such a relationship. However, here we have but two very small samples of inquiry behavior in a rather special situation. Further, we realize that there is more to teaching than inquiry; even if we could accurately assess "global inquiry" the relationship would not be perfect. Finally, teachers' ratings of their student teachers are probably modified by a wide range of personal and social influences which interfere with an accurate assessment of the student as a teacher.

A second and rather powerful influence on the student-teacher ratings is indicated by the .31 correlation between these ratings and G.P.A. ($p < .10$). Evidently academic achievement as well as seeking style was active in determining the ratings. Since G.P.A. and seeking style are essentially unrelated in our group (the correlation between G.P.A. and seeking style = .09) G.P.A. can be considered as related to student teacher ratings independent of seeking style. In Chapter IV it was demonstrated that G.P.A. had little effect in accounting for inquiry behavior. If we consider this as indicating independence between effectiveness of inquiry and variations of G.P.A. for subjects within a limited range of intelligence, it becomes obvious that there are other factors which influence student teacher ratings than those related to inquiry, in particular, factors more closely related to academic achievement.

A number of times in this chapter we have taken the position that inquiry and teaching are closely related. It is our position that the Teacher's In-basket has a good deal of face validity in that it sets forth the kinds of situations with which every teacher must deal daily. Here we recall the distinction between the *preactive* and *reactive* components of teaching made by Philip Jackson (1966). The preactive component consists of those activities which occupy the teacher in preparing for her class, i.e., those things not immediately stimulated by direct student-teacher interaction. The Teacher's In-basket simulates this preactive phase. The two phases are related in that a teacher must adequately understand the personal and social problems posed by children in order effectively to guide them in the learning process.

The effective teacher must be sensitive to problems, must be able to formulate hypotheses and use available information effectively to test those hypotheses and, most important, must be willing to inquire. The willingness to inquire a number of factors. The person must be comfortable with cognitive complexity and disequilibrium because inquiry requires leaving a state of cognitive equilibrium to pass through a state of disorganization and uncertainty toward a hoped for state of reorganization and higher understanding. However, with inquiry there are no guarantees of reaching the goal. The inquirer must be willing to balance the risk of inquiring against the risk of not inquiring. The more comfortable she is with complexity and disequilibrium, the less the perceived risk involved. Thus the inquirer must be willing to become personally involved in the problems and the process of resolution. This tendency for effective inquirers to become personally involved was very obvious in the Teacher's In-basket. Further, the inquirer must often make abrupt cognitive shifts when new information is acquired.

The importance of inquiry to teaching is two-fold. First the teacher must inquire effectively, be willing to risk and become personally involved in order to understand in depth those factors which will influence her students' academic, social and personal development. She must be flexible enough to use the individuality of her students to advantage wherever possible and work around it only as a necessary second choice.

Secondly, the analyses imply that those factors which predispose one to be a good or effective inquirer are also related to continuing development as an inquirer. Seeing teaching as an ongoing inquiry we would expect this development to lead toward development of richer and more effective teaching.

A great deal of current research in inquiry and discovery learning is focused on the enhancement of such processes in children.

We would contend that research on pupil inquiry may be of limited value without equal attention to teacher inquiry. Inquiry is not a process that is likely to be sustained by students alone without adequate participation and modeling on the parts of teachers. It is only when both the teacher and student are participating in a common dialectic wherein both are seeking and changing mutually, that the highest forms of educative inquiry can occur.

CHAPTER VIII

CONCEPTUAL TEMPO AND INQUIRY

Jerome Kagan has suggested that a dimension of human behavior which is critical for problem solving and generalizes across situations, is the inclination to be reflective or impulsive. Reflection-impulsivity is a dimension of behavior that Kagan describes as

> the child's tendency to reflect upon the quality of a cognitive product in contrast to an impulsive and unconsidered response. The child who is prone to respond impulsively in a difficult problem situation (i.e., to initiate a reasoning sequence suggested by the first hypothesis that occurs to him and/or report an answer without sufficient reflection on its possible validity) is more likely to produce an incorrect response than the child whose natural inclinations prompt him to reflect over the differential adequacy of several solution hypotheses and to consider the quality of an 'about to be reported answer.' (1965, p. 134)

Kagan reports that reflection has a tendency to increase with age, is stable over periods of as long as twenty months, manifests generality across situations and is linked to some fundamental aspects of personality organization. The predisposition to be reflective or impulsive was dubbed by Kagan *conceptual tempo.*

The research on conceptual tempo was sufficiently impressive to suggest to us that such a dimension might be important for an understanding of inquiry behavior. Kagan's dimension was relevant specifically to the responses of individuals to situations with high stimulus uncertainty. Surely inquirers in the in-basket situation were called upon to attend to an array of stimuli that vary considerably in the amount of uncertainty inherent in them. It was in order to make the total in-basket situation highly uncertain that instructions were so vague. Most direction was expected to come from the inquirer herself.

The Measurement of Conceptual Tempo

At the time when this study was initiated the test for reflection-impulsivity that had been employed by Kagan was suitable only for children. The most frequently employed instrument was Matching Familiar Figures (MFF), a test where a single somewhat complex stimulus figure was presented to subjects along with six test figures, all but one of which differed in some small and hardly perceptible way from the stimulus. The task of the subject was to identify one of the test figures which was identical in all particulars to the stimulus. Kagan had identified that on such a task there were enormous individual differences in mean latency to first response. Furthermore, the payoff for reflection was low error rate, as reflected in the average correlation reported by Kagan of -.48 between reflection time and errors on the MFF.

Our first task was to construct a parallel form of the instrument which would be suitable for college age students. Using the original Kagan figures as models we developed a 12-item test of Matching Familiar Figures for college students. At the end of the first year of the study we were able to shorten the test to nine items. This adult form which we developed was palpably more difficult than Kagan's original form.

The cards with the stimulus figures and the six test figures are presented to a subject one at a time. The examiner records the number of seconds which elapse between the initial presentation of the card and the subject's *first* response. In addition, he records the total number of errors made by the subject across all nine items. The two basic scores recorded for each subject were *average reflection time* across items and *total errors*.

To analyze these data, subjects are divided at the median on average time and total errors. Since the negative correlation between time and errors is so strong, subjects whose reflection scores are above the median generally are below the median on errors and vice versa. A reflective is defined by Kagan as a subject whose reflection score is above the median for the group and whose error score is below the median. An impulsive is defined as any subject whose reflection score is below the group median while his error score is above that median. Subjects falling into the other two categories are not used in Kagan's analysis.

Findings

The correlation between average time and total errors is generally reported by Kagan to fall between -.40 and -.60. For the present sample, the correlation was -.54 (N=56). When only those subjects classified as dialectical or didactic were used, (N=46) the correlation was -.56.

Table 45 shows the number of subjects falling into each of the four categories for the present sample of 56 subjects. The numbers in parentheses include only those subjects who fall into one of the dialectical or didactic categories.

TABLE 45

NUMBERS OF SUBJECTS CLASSIFIED AS HIGH OR LOW
ON REFLECTION TIME AND TOTAL ERRORS, N=56;
NUMBERS IN PARENTHESES ARE FOR N=46

		Low	High	
Total Errors	High	20 (19)	6 (4)	26 (23)
	Low	8 (6)	22 (17)	30 (23)
		28 (25)	28 (21)	56 (46)

We will begin this section with a brief comparison of the present results to those reported by Yando and Kagan (1968) with experienced teachers as subjects. Table 46 shows the means and standard deviations for reflection time and total errors for the subjects classifiable as clearly reflective or clearly impulsive in the two studies.

TABLE 46

COMPARISON OF AVERAGE REFLECTION TIME (IN SECONDS) AND TOTAL ERRORS[a] MADE FOR PRESENT SAMPLE AND SAMPLE REPORTED BY YANDO AND KAGAN (1968)

	Present Sample		Yando & Kagan	
	Reflectives (N=22)	Impulsives (N=20)	Reflectives (N=18)	Impulsives (N=15)
Ave. Time	81.3	41.9	60.9	15.7
Range	(62-132)	(19-55)	(43-89)	(11-22)
Total Errors	1.05	5.14	2.6	7.8
Range	(0-2)	(3-16)	(0-5)	(7-11)

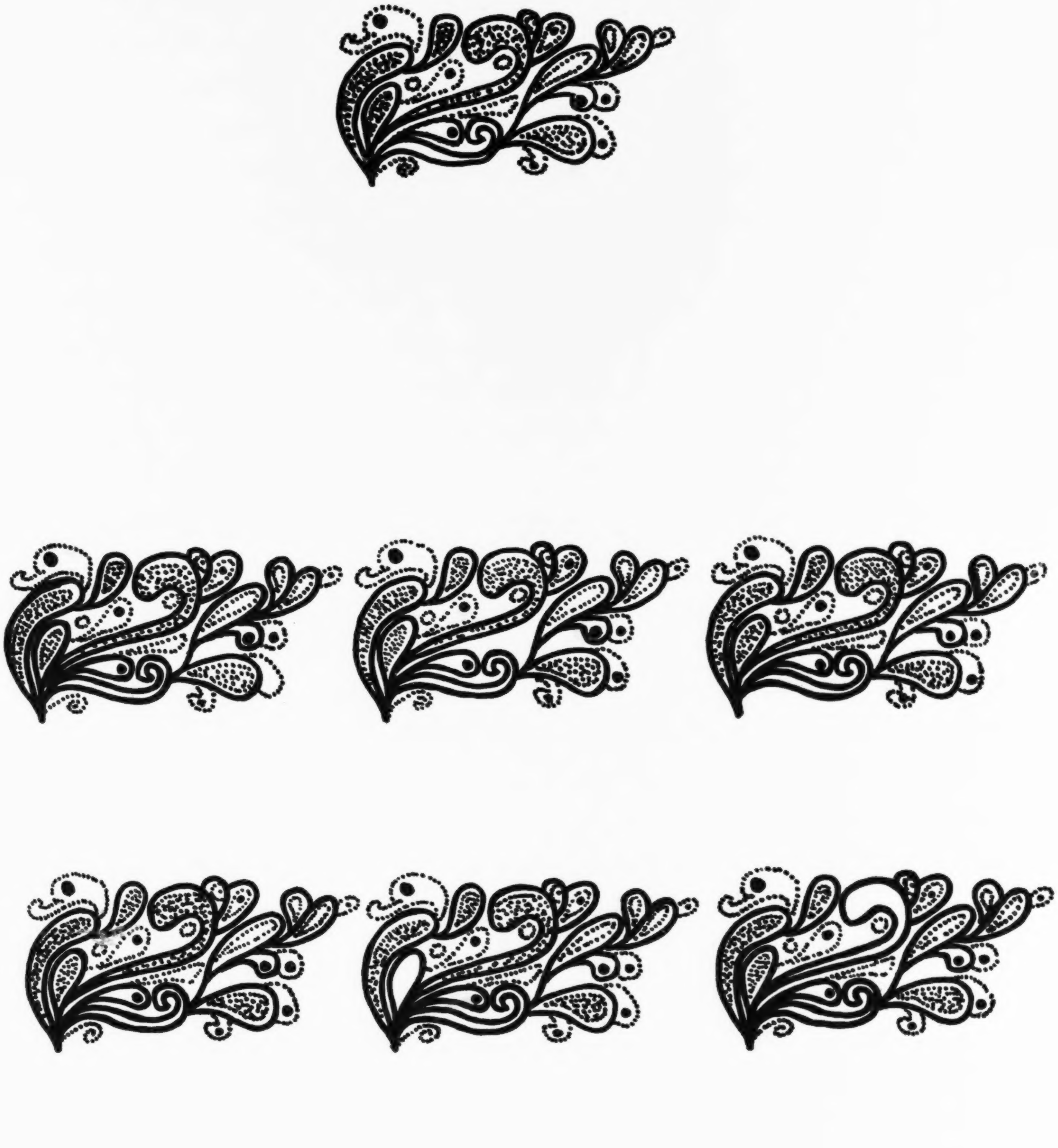
[a] Kagan form of MFF composed of 12 items; present form of 9 items

Our present group clearly appears to be more reflective. Differences in errors is attributable to the fact that the Yando-Kagan test had 12 items compared to our nine. The difference in reflection time is probably a function of item difficulty. The items used in the present study (see example in Figure 20) may be more difficult than those used by Yando and Kagan.

We anticipated that the tendency to be reflective would be related to dialectical seeking predisposition because dialectical behavior requires, among other things, that the person take time to consider alternative hypotheses and courses of action. Such a trend did in fact exist within our subject sample. Of the dialectical group 48% were reflective and 33% impulsive. The opposite trend was apparent in the didactic group where only 28% were reflective and 48% were impulsive.

FIGURE 20

SAMPLE ITEM FROM ADULT MATCHING FAMILIAR FIGURES TEST



A number of comparisons were now made between the reflective and impulsive groups in terms of their respective scores on the various determinants of inquiry. Although no single difference between the two groups was great enough to reach statistical significance ($p<.05$), in every case but one the differences were in the predicted direction. Reflective subjects were more complex, preferred discussions over lectures, were less stereopathic, were greater risk takers and were more fluent in making word associations. Further, the reflective subjects were scanners, more student oriented, less test anxious and less defensive than the impulsives. Only in terms of politics were the impulsives more dialectical (related to liberal politics). The reflectives were also superior to the impulsives in grade-point-average, Reading scores and performance on the tests of the CQT. Although it must be remembered that none of these differences was significant, the fact that all of the differences (with the exception of politics) were in the expected direction indicates that a rather strong trend is in evidence.

Since there appeared to be a discernible relationship between the inquiry predictors and reflection-impulsivity, we expected a similar pattern for the inquiry performance measures of the Teacher's In-basket. Once again, the differences between individual mean scores of reflectives and impulsives did not reach a level of statistical significance. However, as with the seeking style predictors, the direction of the differences favored the reflective subjects. During both administrations of the in-basket the reflective group exceeded the impulsive group in General Inquiry, Competence and Problem Sensitivity. Reflectives were superior to impulsives on Information Sources only during Administration II. Surprisingly, the Time variable failed to distinguish between the two groups.

Reanalysis of Conceptual Tempo

We had long speculated that it might be unnecessary to eliminate subjects from analysis of conceptual tempo who did not fall into either of the two clearly defined categories of reflection and impulsivity. In the Yando and Kagan study 30% (13 of 43) subjects were eliminated; in our own study 25% (14 of 56) were dropped. When dealing with already small samples such a mortality rate can be disconcerting.

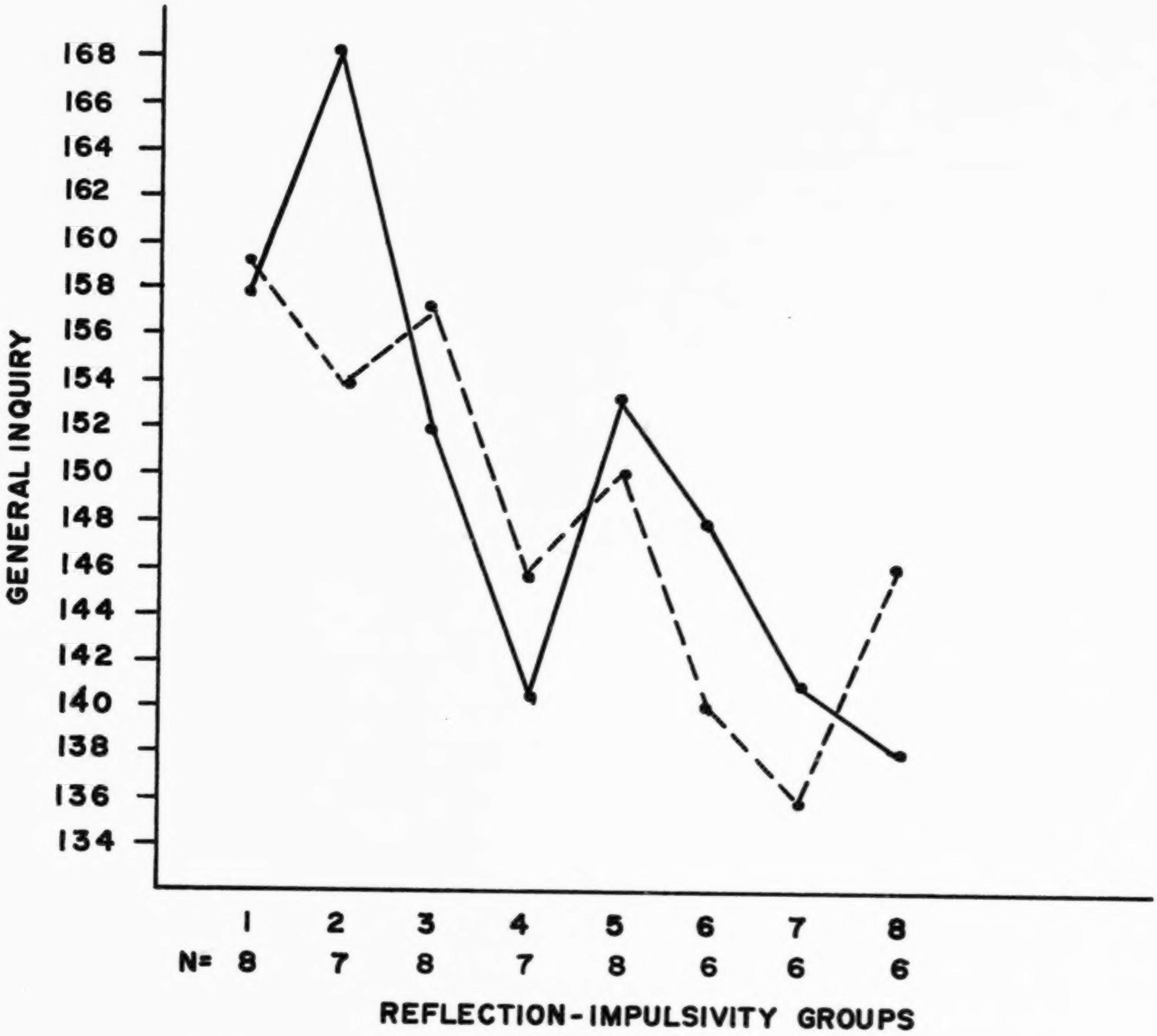
What could be said about subjects who were low in reflection time, but made *few* errors? What of those who reflected at length, but erred mightily nevertheless? Our predilection was to expand the notion of conceptual tempo to include those two hitherto segregated groups of subjects. Might not the low reflection-low errors subject be an individual who reflects as long as necessary to make a decision? In the present study this group reflected an average of 51.17 seconds per item--not an eternity, but surely sufficient *for them* to make a decision in the face of uncertainty. The high reflection-high error group, in contrast, seemed merely inept. They reflected an average of 79.37 seconds before responding to an item. They averaged 3.3 errors for the nine-item test.

Our hypothesis was that inquiry effectiveness, as measured by the general inquiry score, would relate to performance on MFF in the following order from highest to lowest: (1) low reflection-low errors, (2) high reflection-low errors, (3) low reflection-high errors and (4) high reflection-high errors. We thus treated the MFF as a measure of "warranted decision-time" wherein the warrantability of responses was as important as their preceding latencies. Since the two middle groups (Kagan's reflectives and impulsives) were about three times the size of the two polar groups, the middle groups were each broken down into three subgroups on the basis of error rates.

Figure 21 represents the relationship between this way of categorizing MFF performance into eight groups and scores on the general inquiry variable. There is a clear, though hardly monotonic, trend in the predicted direction. The low scores for Group 4 and the high scores for Group 5 indicate that accuracy alone will not predict inquiry performance. The reversal in inquiry

FIGURE 21

MEAN GENERAL INQUIRY SCORES FOR EIGHT REFLECTION-IMPULSIVITY GROUPS, ADMINISTRATIONS I AND II



Group I - low reflection, low errors
Groups 2-4 high reflection, low errors
Groups 5-7 low reflection, high errors
Group 8 high reflection, high errors

—— Administration I
– – – Administration II

performance of these groups indicates that there must be a balance between reflection and accuracy. Those people who are reflective, but not clearly superior in accuracy, may be poorer inquirers than those who are impulsive, yet do not completely sacrifice accuracy in their problem solving.

We now wished to examine the relations of our scaling of the MFF and both the predictor variables and the individual inquiry criterion variables. In order to increase the variability of the MFF score each of the eight categories was divided in two, thus yielding a 16-point scale. Subdivisions were again made on the basis of error rate. When errors were equal average time was used. The resulting scale was therefore predominantly a measure of decision accuracy and only remotely a measure of decision-time. We called this measure the *Reflection Accuracy Index*. High scores reflect low error rate and warranted reflection time; low scores represent high error rate and unwarranted reflection time. Scores on the RAI correlated -.67 with total errors and +.10 with average time.

Table 48 shows the correlations of the inquiry predictor scores with MFF average time, total errors and the derived Reflection Accuracy Index. In general, the correlations between the inquiry predictor variables and RAI are of a greater magnitude than with either of its two components, average time and total errors. The significant correlations between RAI and the Reading and CQT scores indicates that this index, like reflection-impulsivity, is related to intelligence. It is the combination of time and errors which is significantly related to intelligence in this sample and not the components taken separately. Interestingly, RAI is negatively correlated with defensiveness and Rorschach Dd%. It will be recalled that both defensiveness and the tendency to respond to small details on ink blots were also negatively related to inquiry performance. The relationship of RAI to general seeking predisposition is indicated by the correlation of .31 with the summary seeking style predictor variable.

TABLE 47

CORRELATIONS OF 16 PREDICTOR SCORES WITH MFF AVERAGE TIME, TOTAL ERRORS AND THE REFLECTION ACCURACY INDEX, N=56†

Variable	Average Time	Total Errors	RAI
Complexity	-08	15	15
Lecture-Discussion	10	-04	14
Inventory of Beliefs	-06	10	18
GPA	-01	06	15
Word Association	08	30	21
Closure Flexibility	11	07	17
Syllogism-Risk	-04	21	16
Test Anxiety	07	02	02
Defensiveness	08	02	-25
Politics	09	04	03
Block Design	05	-01	05
Stroop	21	-27	-14
MSU Reading	-10	20	26
CQT Numerical	13	07	25
CQT Total	10	20	28
Rorschach Dd%	-02	-21	-24

†For N=56, the probability of reaching a correlation $\geq .22$ by chance=.10, the probability of reaching a correlation $\geq .27$ by chance=.05, the probability of reaching a correlation $\geq .31$ by chance=.01.

Table 49 indicates that both total errors and RAI are significantly related to inquiry performance. In most cases, average reflection time is unrelated to measures of inquiry behavior. The addition of the 14 subjects not previously classified as either reflective or impulsive seems to have altered the relation of reflection time and inquiry. Where reflection time was previously held to be related to inquiry (when only reflective or impulsive subjects were considered), it now seems that accuracy is more important to inquiry and reflection is related only to the extent that it determines decision accuracy.

Discussion

We have demonstrated in this chapter that the construct invented by Jerome Kagan, reflection--impulsivity, relates moderately to the variables central to the present inquiry in the predicted directions. Kagan's notion that there are individually consistent predispositions to be reflective or impulsive in the face of situations embodying stimulus ambiguity or uncertainty was hypothesized to relate to the manner in which individuals would deal with an inquiry situation which was constructed in order to be ambiguous or uncertain. It was observed that reflectives were generally more effective inquirers than impulsives as would be predicted by the theory. Further the reflective-impulsivity distinction was seen to relate to the determinants of inquiry as defined in the prediction portion of this study. However, the error-rate component of the conceptual tempo construct appears far more important than the amount of reflection time itself.

We have also demonstrated that those categories normally omitted from reflection-impulsivity analyses are also related to the inquiry predictors and inquiry behavior. The relationship between inquiry and errors on the MFF is fairly straightforward and intuitively simple. All other things being equal, the more accuracy with which an individual makes judgments, the more effective will be her inquiry.

TABLE 48

CORRELATIONS OF MFF AVERAGE TIME, TOTAL ERRORS AND REFLECTION ACCURACY INDEX WITH INQUIRY-PERFORMANCE MEASURES, N=56[†]

Variable and Administration	Average Time	Total Errors	RAI
General Inquiry I	03	19	32
General Inquiry II	00	24	25
Competence I	-04	15	24
Competence II	12	19	20
Problems I	00	20	27
Problems II	00	23	24
Time I	07	17	06
Time II	-17	22	23
Bits I	08	16	17
Bits II	02	03	-04
Sources I	09	11	27
Sources II	-15	20	18
Shift I	12	09	24
Shift II	03	06	05
Shift Ratio I	20	-04	21
Shift Ratio II	16	-06	-11
Problem Solving Bits I	12	-10	04
Problem Solving Bits II	-04	03	-03
Problem Solving Ratio I	08	-30	-16
Problem Solving Ratio II	-07	10	00
L-Bar I	00	-31	-18
L-Bar II	-10	14	08

[†] For N=56, the probability of reaching a correlation ≥.22 by chance=.10, the probability of reaching a correlation ≥.27 by chance=.05, the probability of reaching a correlation ≥.31 by chance=.01.

Our analyses also raise some questions about conceptual tempo as a construct. By removing subjects who do not fit the reflective-impulsive dichotomy Kagan may consistently confound reflection and accuracy. It may be that many of the variables, such as intelligence or reading ability, that correlate consistently with reflection time, are in fact correlating with that aspect of reflection which involves the ability to make accurate discriminations. Would this totally invalidate Kagan's construct? Clearly not. We learn from his analyses that, in a situation embodying high response uncertainty, accurate decisions are *usually* contingent upon adequate delay of the impulse to respond.

It would appear that this tendency to delay long enough to ensure decision accuracy is related to problem sensitivity and inquiry competence. The sensing of a problem entails reflection, both prior to reacting to a discrepancy and, subsequently, in order to act upon it. Inquiry competence is very much like decision accuracy. It requires persistence and sensitivity. Whether due to the reflection component, the perceptual accuracy component or, most likely, the combination of both, our adult version of the Kagan MFF Reflection-Impulsivity Test correlates with the predictors and measures of inquiry. As such it adds something to our understanding of the dynamics of inquiry.

CHAPTER IX

GENERAL DISCUSSION: ELEMENTS OF A THEORY OF INQUIRY

The Rabbis of the Talmud asserted that a biblical passage could be interpreted at any one of four levels. The first level was that of *plain meaning* (in Hebrew, *p'shot*). Here the nature of the explanation given was nothing more than an attempt to convey with no embellishment the direct literal meaning of the text. The second level was that of *interpretation* (in Hebrew, *d'rash*). Here an attempt was made to go beyond the literal meaning of the text and arrive at its intended somewhat deeper meaning. The third level of interpretation used by the Rabbis was that of the *hint* (*remez*) or speculation based on the most tenuous of evidence. Here the purpose of the Rabbis was to use the text as the starting point for rather elaborate and often hardly tenable flights of fancy. There was yet a fourth level, that of the *secret* or mystery (*sode*). At this level of interpretation it was assumed that the text did not mean what it seemed to say, but rather something totally different. Often this interpretation was based not on the contents but rather on some aspect of its form, such as the number of letters or the pattern of spacing between syllables. It is at this level that the numerological interpretations of the scriptures were often made. It is at this level that the Kabala, or mystical literary tradition, was developed. It was clearly the level of interpretation that went farthest afield from the literal meaning of the text. The four levels are summarized in the Hebrew acronym

PRDS, pronounced *pardes*, meaning orchard.

The discussion of a long and involved piece of behavioral science research involves levels of analysis and interpretation not unlike those employed by the Rabbis of the Talmud. Surely we must describe the literal meaning of the data. This is what we have attempted to do in the chapters which have preceded this one. It is also our responsibility to offer interpretations of the findings in the light of the theoretical formulations which gave rise to this research and other considerations which may have come to our attention in the intervening period. This has already been done to some extent in earlier chapters and will be extended in the present one.

It is also the role of the scientist to use his data for speculation. Such speculation will usually range from the most conservative attempts to interpret trends all the way to unbridled forays into scientific prophesying. There are times when the investigators cannot resist the temptation to leave the substance of their data behind and to seek meanings and directions for which little or no basis can be found in their reported work. In the 95% of such cases when prophecies fail, the predictions are usually compassionately forgotten. On those rare occasions when predictions are borne out, the fortunate prophet is hailed as a brilliant soothsayer.

The present chapter will deal with some unfinished business at the level of *d'rash*, a number of speculations at the level of *remez* and, dispersed among them, a few unblushing contributions that must be categorized as *sode*. We shall begin with a discussion of the historical context of research and theory within which this research was conducted. We will then examine some contemporary thinking in linguistics which bears formal resemblance to aspects of our work. Contemplated research on the process of inquiry in medicine will then be described. The chapter will continue with a discussion of methodological questions raised by this study and a note on some limitations of the concept of inquiry which directed our research. The chapter will conclude with references to the relationship of learning to inquiry.

Patterns of Psychological Theory and Research

We have been observing over the past decade a rapidly accelerating shift from older psychological positions to new ones. The fields of cognitive psychology and learning appear to be moving from the classical S--R paleo-behaviorism to a neo-behaviorism of more cognitive or even mentalistic bent. The emphasis on merely describing observable behaviors is being replaced by an insistence that one speculate about, model and attempt to describe intervening intellectual processes. It would be difficult to point to a single contribution which heralded this shift in concern. No doubt the recognition by the neo-behaviorists that complex processes, especially language-related, could not be discussed without positing increasingly complex mediational terms was a factor (even though camouflaged by the required myth of mediational "responses"--ignoring that for a *response* to be 'mediate' rather than im-mediate is for it to lose its major virtue as an operational construct). No doubt seeing the behaviorists so willing to posit mediating responses encouraged moribund mentalists to emerge from their hiding places.

Despite a premature obituary by Howard Kendler, the cognitive position had never become entirely extinct. Based on the criterion of amount of empirical research generated by Gestalt theory, the previously most influential cognitive psychology, Kendler had concluded that the cognitive position was either asleep or dead.

Sometime in the middle 1950's cognitive psychology's long hibernation began to end. The work of Bruner, Goodnow and Austin (1956) dealt unabashedly with the study of strategies of concept attainment. At about the same time the Carnegie Tech group of Newell, Shaw and Simon (1958) began to develop their information processing models for the computer simulation of complex problem solving processes. Contemporaneously Noam Chomsky (1956) developed a transformational approach to the study of linguistics which constituted a direct attack on the behavioristic Bloomfieldian position in linguistics that had dominated that field for so long in this country. The work of Hebb (1960) became much more popular during that time with his neurophysiological theorizing about the nature of central processes. Hebb's bold statement to the American Psychological Association on the occasion of his presidential address emphasized the need to eschew mere behavior as the total subject matter of psychology and to return to the study of the mental processes that had originally been the heart of the discipline. As Hebb insisted, " . . . let us press on with the serious, persistent, and if necessary daring exploration of the thought process by all available means." (*ibid,* p.745) He did not argue that the behaviorist revolution had been unnecessary. Far from it. The behaviorist revolution had been a necessary stage in the development of our behavioral science. But the stage was now set for a new actor.

In 1960 a book appeared which attempted to bring a theoretical synthesis to the hitherto disparate approaches of transformational grammar, psychoneurophysiology, information processing models and the general cognitive tone of much of the new writing. This book was *Plans and the Structure of Behavior* by Miller, Galanter, and Pribram (1960). It was rough, incomplete, frequently imprecise, exciting, stimulating and thoroughly irreverent. Far from the last word on the subject, it was barely the first. But it managed to emphasize the importance of planfulness, systematic or structural analysis of behavior and the reasonableness of the analogy between the computer and the mind of man as information processing systems. It also reacquainted psychologists with the important role played by the thinking of John Dewey before the turn of the century. Dewey had anticipated the inadequacies of the reflex arc even before Thorndike and Watson had insisted upon its centrality as the major unit of American psychology.

It is clearly no accident that the middle 1950's also heralded a renaissance in American recognition of and excitement with the genetic epistemology of Jean Piaget. A body of research and theory that had been both substantively and methodologically unpalatable to American psychologists suddenly became the source for many exciting ideas. Whereas in 1955 the number of references to Piaget in the psychological literature were surely few, by 1965 he was unquestionably the major force in child psychology.

The field of education was not impervious to this new trend. The middle 1950's saw the growth of the new curricula in mathematics and science which emphasized cognitive processes, discovery learning and heuristics. The spirit of this curriculum revolution was captured by Jerome Bruner in *The Process of Education* (1960). The speed and vigor of this revolution has abated very little since the publication of that book.

In 1968 we observe that the revolution continues to grow. Linguistics has been increasingly dominated by the transformational position (Chomsky, 1965). In our personal opinion the Cartesian Innate Idealism of Chomsky's language acquisition theory will turn out to be excess baggage in what is essentially a return to cognitive theorizing about the nature of language. (Somewhat ironically, the movement which has paralleled cognitive psychology in popularity during the 1960's has been the radical behaviorism of B.F. Skinner thus leaving the old mainstream a now-dry creek bed.) More frequently than ever, accounts of complex human cognitive processes are advanced in the language of information-processing.

It is in this spirit that our current studies of inquiry are conducted. They reflect the common concern in this decade of both psychology and education for better understanding of the characteristics and determinants of the most complex human problem solving processes. It is a return of psychology to the discipline William James knew as *The Science of Mental Life*.

Linguistics and Inquiry

The new look in the science of linguistics has double significance for the research we have been conducting. We have already discussed the manner in which the Chomskyan rationalism and emphasis upon underlying mental processes has been but one reflection of the general trend in the behavioral sciences toward increasingly cognitive explanations for behavior. There is more, however, to the work of Chomsky that is relevant to our present theorizing about inquiry.

Chomsky calls us to recognize that the most important distinction to be made in linguistics (and possibly in any behavioral science) is between performance and competence--that is, between the observable sequences of behavior which an organism displays and that underlying set of rules or operations without which the observed behaviors could not have been generated. Chomsky develops ingenious arguments which cannot be adequately reiterated here, to demonstrate that it is impossible to account for certain distinctions, innovations and/or linguistic productions of which we are capable without positing an underlying system of grammatical competence. He therefore proposes that we analyze language through examining speech behavior as a function of an underlying set of rules and principles which serve to transform the deep structures of the language into the surface structures of speech through which we communicate. This distinction between deep and surface structure is a fundamental one for Chomsky.

A favorite example that Chomsky uses is the following: Let us take the two sentences "John is easy to please" and "John is eager to please." On the surface, they appear to be structurally identical. Yet, as native speakers of English, we recognize that one of the sentences can be nominalized (that is, the entire sentence can be transformed into the noun phrase of a new sentence) while the other cannot be so nominalized. Thus, whereas the sentence "John's eagerness to please was remarkable" is acceptable in English, the nominalization "John's easiness to please" is clearly unacceptable.

Chomsky maintains that speakers of English do not make the error of attempting to nominalize the latter sentence. Clearly then, speakers of English recognize the difference between these two sentences, identical though they be in surface characteristics. That is, native speakers of English may have some understanding, albeit intuitive and unconscious, of the difference in deep structure between these two sentences. Our speaking of English, Chomsky asserts, is directed by such deep structure rules.

It can be reasoned that much of complex human behavior can be analyzed in the same terms as Chomsky's analysis of speech behavior. That is, we may view the complex sequences of surface behavior, be they motor, verbal or both, as surface structures of infinite potential varieties generated through the regular and lawful operation of an underlying deep structure of quite finite rules and principles. The job of psychology then is analogous to the job of linguistics. Just as the linguist is responsible for identifying that finite set of rules which underlies and is capable of generating the potentially infinite set of speech behaviors, so the responsibility of the psychologist is to identify that underlying set of psychological rules which is capable of generating the potentially infinite set of human behaviors. That is, to say the least, a rather gargantuan task.

Jenkins (1968) believes that this is a reasonable approach to the study of behavior. He describes how members of his institute staff are using precisely such an approach in an attempt to understand the behavior of children when dealing with certain Piagetian tasks. They are attempting to go beyond descriptions of what the children do in order to generate that system of rules which is capable of accounting for the wide variety of their behaviors.

Linguists refer to that set of rules which can generate all acceptable sentences of a language and none of the unacceptable sentences as the *grammar* of the language. We see as an ultimate goal of the research program described in this report the development of a *grammar of inquiry*. Such a grammar would consist of the set of underlying rules or operations through which we can explain the enormous variety of individually different sequences of actions, queries and decisions that characterize the observed inquiries of subjects. The present research serves as a small beginning for such an effort. The next stage would entail an attempt to write a computer program to simulate the inquiry performance of in-basket subjects. One of us (R.M.P.) is currently working on such a project based upon careful analysis of the complete inquiry protocols of a few subjects. If such a program could be made to work it would be a first approximation to the grammar of inquiry.

Method and Theory

Highly relevant to the studies described in this report is the seminal work of the Dutch psychologist, A.D. de Groot (1965). His general approach to research, the Selzian tradition in which he works, his relation to the general information processing tradition, all are extremely compatible with the thinking that generated the present studies. We will examine a series of statements made by de Groot to characterize his research and the manner in which it parallels our own. These quotations will be taken from his chapter in a recently published symposium (Kleinmuntz, 1966, pp. 19-20). He begins by describing his research goals and methods.

> First, the research is directed toward systematic description of cognitive phenomena rather than to strict hypothesis testing. Second, we keep machine simulation in mind, but we hardly do it as yet. Third, the experimental settings are often more like real-life than the strictly controlled artificial conditions of the laboratory. Fourth, extensive use is made of introspective techniques of various kinds. Fifth, as a result, protocol coding and interpretation are of crucial importance (and consume a large part of our time). Sixth, prospective outcomes are expected to be primarily valuable to the extent we succeed in providing adequate, systematic process descriptions, possibly to be used as a basis for simulation.

The emphases which he makes are precisely those we have made at the introduction to this research. We too are concerned at this stage of our research primarily with developing a systematic description of cognitive phenomena. It is for this reason that much of our work is directed toward the identification and clarification of parameters of this process rather than in exploring the manner in which they can be controlled and modified.

We too emphasize the importance of studying cognitive phenomena in situations which simulate real life, rather than in the totally artificial settings that have characterized the psychological laboratory. The very advantages which memory drums and nonsense syllables bring to experimental psychology by virtue of their capacity for raising internal experimental validity seriously impair their claim to external validity.

Like de Groot, we too make extensive use of introspective techniques. Also like de Groot our introspective techniques bear very little resemblance to those of Titchener. Again, like de Groot, we spend what many (ourselves included) would consider an inordinately large amount of time in the analysis, coding, reanalysis and recoding of the protocols generated by our subjects.

de Groot elaborates on his ideas in the form of a series of assertions or statements. We shall repeat only the first six of these and comment on their relations to our own thinking.

> I. It is worthwhile and scientifically important to try one's hand at a descriptive analysis of high level, complex, cognitive processes on the basis of experimentation in a real-life-like setting.--A statement of *valuation.*
>
> II. It is worthwhile and scientifically legitimate practice to collect data by means of introspective experimentation: "Systematic introspection," "thinking aloud" and the like.--A statement of *methodology*.
>
> III. A process of directed thought (for example, in problem solving) can be conceived as a linear sequence of operations that are actively carried out by the subject according to a system of linkings governed by laws.--A statement on the theoretical *model* used.
>
> IV. The system, mentioned in III, is characterized by a hierarchical structure of operation dispositions --"solving methods," "typical problem transformations," "heuristics"--ordered by co-and subordination, priority rules, outcome (for decision) criteria, etc.--A statement on the *model* again.
>
> V. From experimental evidence and analysis, it must be possible to develop an ordered classification of human mental operations to cover every method, trick, heuristic, transformation that may be instrumental in

> productive thinking (problem solving, creativity included). --An expectation of *sufficiency.*
>
> VI. It must be possible systematically to relate the taxonomy (IV) as described largely from introspective experimentation, to the outcome of statistical analyses of cognitive achievements such as factor analytical studies of mental test performance.--An expectation of a *correspondence* between two systems. (de Groot, 1966; pp. 20-22)

de Groot's elaborations reflect our own feelings that not only are the kinds of thinking-aloud or introspective methods which we have employed defensible in this research; they are indispensible given the objectives of the current investigation. We would differ from de Groot mainly in an additional item on our research agenda. This is the somewhat uniquely American preoccupation with not only describing the nature of phenomena but also identifying the systematic *individual differences* that accrue to the behaviors being studied. David Bakan (1968) has suggested that the Americanization of Wundt by Cattell and Hall involved essentially taking the experimental psychology of that German scholar and placing it in an individual difference mold about which Wundt had never dreamt.

With de Groot we feel strongly that the responsibility of those who would study thought processes is not to avoid introspection but rather to employ it most effectively. We see introspection not only as a source for generating hypotheses but also as a means for testing them. We do not believe that there is an isomorphism between the introspected or retrospected protocol of subjects and their thought processes. Introspection and retrospection are behavior in the same way that eyelid blinking or serial learning constitute behavior. If we can predict the contents of introspective protocols and effectively and reliably categorize them we have made an important scientific advance. We might further add that the widespread use of "verbal reports" in psychophysical research sustained introspection under a useful alias for many years. The systematic employment of introspective protocols as the basis for developing computer simulations of human cognitive processes has effectively dampened the clamor of criticism usually aroused by introspectively oriented research. We should hope that research such as our own will help advance this cause.

The Role of Simulation in Psychological Investigation

We must also agree with de Groot's emphasis upon the need for real-life-like settings for the study of human behavior. It is here that we as psychologists are caught in a major bind. On the one hand, in order to maximize the internal validity of our measurements we must develop highly controlled settings wherein we can govern our research. This has long been recognized as a necessity, but it is likely that the behavioristic tradition in America over-emphasized the importance of reliability and control to the detriment of that other equally important factor in the development of experimental settings, that of external validity (Campbell and Stanley, 1964). We must also in our many experiments attempt to *maximize the similarity* between the conditions in which the behavior studied is examined and those other conditions, whatever they may be, to which we may ultimately wish to make inferences. That is, not only must we be concerned that the individuals whom we study as a sample are in fact representative of that human population to which we wish to infer the results of this experiment, we also must be concerned that the experimental conditions can serve as a sample from which to make inferences to a population of real-life conditions which are often our most important concern. Needless to say this latter principle has rarely been sufficiently worrisome to the experimental psychologists. It is of primary importance to us, however, as it is to de Groot.

We believe that the methods of simulation (we speak here of situational, not computer simulation) have great potential for serving as the ideal middle ground between the total artificiality of the typical experimental psychology laboratory and the wholly uncontrolled environment of the behavioral ecologist studying organisms in their natural habitats. In the simulation approach we espouse, the attempt is made by the investigator to create an artificial environment that resembles the real-life environment to which inferences are to be made as closely as possible. However, careful control over every input into the situation is maintained and elements of the situation can be experimentally manipulated as needed. In both our own work and de Groot's, the emphasis heretofore has been on identifying, classifying and measuring the behavioral parameters that can be observed in these simulated settings rather than in manipulating them experimentally. It will be only a short time before we begin such experimental manipulations of our own.

Research in Medical Inquiry

We have already begun plans for a series of descriptive and experimental studies of inquiry in medicine. These studies will begin with systematic observations of the inquiry behavior of physicians *in vivo*. These observations will be used to develop a tentative model of medical inquiry sufficient to allow development of a series of simulations similar to medical in-baskets. (We find that the term *basket* has unfortunate connotations to physicians. We therefore will simply refer to them as illness simulations.)

Diagnosticians identified by the medical community as *criterial physicians* will then be carefully observed working with the simulation materials. Their patterns of sensing, formulating, searching and diagnosing will be intensively analyzed directly and through subject retrospection using videotape playback to stimulate their recall (Bloom, 1954; Kagan and Krathwohl, 1968). In this manner we hope to develop empirically-based criterial models of medical inquiry.

Our next task will be to train medical students to match criterial models of medical inquiry. A series of experimental treatments will be studied. These will include didactic teaching of strategies of medical diagnosis; demonstrations of medical inquiry by live physician models; demonstration with videotaped physician models; and use of written descriptions of the inquiry behavior of model physicians.

If what is learned under such conditions is a deep structure grammar of inquiry, it may be acquired much like the grammar of a language. A young child learns the grammar of his first language through imitation and modelling, not through didactic instruction in rules and principles. We are hypothesizing that through creating for the medical student a careful sequence of inquiry experiences involving criterial models of medical inquiry we can modify the medical neophyte's inquiry performance in desired directions.

The Generality of Inquiry

In examining the limitations of this study we must not forget that a question left unexamined is that of the generality of inquiry as a process. Schwab (1964) has cautioned against treating inquiry as a unitary or universal set of principles or operations. He states

> . . . enquiry, as here conceived, is not a universal method or logic. There are differences among enquiries in science. There are even greater differences between scientific enquiry and enquiries which aim at decision and action. There are further differences between these and the activities appropriate to objects of art. Enquiry is far from being a universal logic. On the contrary, it is only a generic envelope for a plurality of concrete enquiries. Each one arises in relation to a specific subject matter and the essence of each lies in its own substantive conceptions, its own data, and its own questions asked and answered. It is enquiries in their plurality and concreteness with which we are concerned.

It is thus clear that we cannot generalize from the principles of effective inquiry in the Teachers In-basket to principles of effective inquiry in general. It is likely that what constitutes effective inquiry in any situation will be a function of the concrete demands of that situation and whatever logic is inherent in the discipline of which that situation is representative. It may yet turn out that such a generality is quite pervasive. Ultimately this question must be answered empirically.

Some evidence for the possible generality of inquiry comes from its predictability in this study. It will be recalled that we were able to define a cluster of determinants of inquiry behavior in this situation. It is further clear that this cluster is not radically different from combinations of constructs used to characterize similar kinds of behavior in other settings (e.g., Harvey, Hunt and Schroeder, 1961; Stern, Stein and Bloom, 1956). It appears that as an individual assumes a more polar position with respect to his personality style, the matter of situational specificity becomes less important in predicting his likely coping behavior. As the individual moves toward the less differentiated part of the distribution of styles, situation specificity may be the major determinant of his inquiry behavior.

To discuss the generality of inquiry is more than to describe the consistency of individual behavior across situations. We must also discuss the relations between that process we have herein called inquiry and the variegated processes investigated by psychologists under the heading *learning*. It is to a consideration of that contrast that we now turn.

Learning and Inquiry

This research had its roots in philosophy. More specifically, the writings of John Dewey stimulated our thinking about inquiry and the manner in which it might be studied. Contrasting Dewey's conception of inquiry with current characterizations of problem-solving and learning in psychology led directly to the research approaches reported in this volume. It is now necessary to reflect on the research we have completed and to ask how it might articulate with the constructs and controversies which dominate both psychology and education today.

Learning is traditionally defined as "a change in behavior caused by experience." More accurately learning is a process which is inferred from an observed behavioral change. The purpose of that definition is to distinguish *learning* from that class of changes usually called *maturation*. It is of much less use in distinguishing learning from inquiry.

A number of alternative comparisons seem possible. We could view learning and inquiry as two totally separate domains. An individual is either learning or inquiring, never both. Such a proposition would necessitate the positing of generally separate underlying processes, conditions and determinants for learning and inquiry. This seems very unlikely.

Another alternative is to consider the two processes related as genus to species. But which is to be the general case and which the specific? Gagné (1965) would consider learning the general set and inquiry as the highest form thereof. Dewey (1938) might insist that the inquiry paradigm is most general and learning a special instance of inquiry.

A cat in a problem box who must discover the mechanism which will allow him to escape is engaged in a primitive form of inquiry. A consequence of his activities is a relatively permanent change in behavior, i.e., learning. The subject in the Teacher's In-Basket is surely engaged in inquiry. We also have reason to believe that some subjects change subsequent inquiry behavior on the basis of inquiry experience. Here again, we see learning result from inquiry.

Clearly not everything is learned via inquiry. Much of human learning is accomplished by being taught. The student does not construct, discover or independently invent the necessary solutions; they are provided to him by a teacher. Much of the current argument over the learning by discovery issue (Shulman and Keislar, 1966) is based on the question of whether learning from being told is as effective as learning by inquiry. The research findings suggest that when the objectives of learning are specific and reproductive, retention and transfer are most readily effected through carefully guided didactic teaching. When the objectives involve the learning of principles or general heuristics, having the student discover the principle through independent inquiry leads to longer-term retention and broader transfer.

At this stage of our inquiry into inquiring we must leave most of the question of learning unanswered. We would speculate that both learning and inquiry are aspects of a more general process of knowledge acquisition. What we call by these different names are merely different manifestations of an underlying set of processes.

This surely does *not* mean that we will eventually find that such higher forms of learning are merely concatenated forms of classical and operant conditioning. We would anticipate that accounting for inquiry behavior will require the positing of far more complex mental processes than the reflex arc. These will be regular, systematic and lawful, in no way mysterious or occult. The principles determining inquiry behavior are likely to be, as Roger Brown (1968) has said of language, ". . . as ordinary as an anthill--or the solar system."

CHAPTER X

CONCLUSIONS AND IMPLICATIONS

We began this report by invoking the name of Janus, the god of beginnings. He is, of course, also the god of endings. It is in that capacity that we shall now invoke him once again. Janus' two purviews will come in handy at this point for the authors and readers have now reversed positions. It is the reader who now desires to look back on this research. But the researchers are already looking forward to the implications of these studies for future inquiries.

Another role of a final chapter is to tie together loose ends and generally put one's house in order. An invocation to Janus is equally apropos for such housecleaning chores. Janus not only contributed the word January to our lexicon--he is also the source for janitor!

Conclusions

A number of conclusions are warranted on the basis of these studies. First, through simulation of a complex problem situation and use of "thinking aloud" techniques it is possible to conduct systematic studies of inquiry performance. Inquiry performance can be characterized in terms of a set of variables which describe different phases or operations of inquiry. These variables are correlated with measures of intellectual functioning, values, attitudes and personality which define *seeking predispositions* or *styles*.

The conception of seeking styles appears to apply most appropriately to clearly defined discrete types rather than in a continuous manner along a single dimension. Our sample was selected in order to reflect a clear typology and, to the extent that it did, the predictions concerning determinants of inquiry were supported.

Individuals who can be characterized as politically liberal, associatively fluent, cognitively complex, willing to risk on a logical task, sound interpreters of written passages, non-stereopathic in their values, reflective and non-anxious (called dialectical types) will tend to manifest high problem sensitivity, use a wide range of information sources and be judged as competent inquirers. They will expend more time in inquiry, during which they will juxtapose or shift among sources of information a great deal. They will expend much of that time in *problem-solving* activity, as against non-problem oriented *survey* activity.

Dialectical types will tend to be effective inquirers whether high or low in academic achievement. Those low in achievement may require practice before manifesting high competence, but will expend time on inquiry and be sensitive to problems from the very beginning. Didactic types, those low on the predictor measures, appear relatively unable to profit from inquiry practice or from an intervening experience relevant to the problem-domain of the inquiry.

Individuals scoring highly on a variable such as problem sensitivity consistently reflect certain dynamic qualities in their inquiry behavior. These include increased cognitive shifting, more problem-solving activity in inquiry, proportionally less surveying behavior and longer problem-solving sequences. The philosophical concept of a *dialectic* very adequately describes much of an effective inquirer's behavior.

The studies we have reported have implications for research in other domains. It is to these implications which we now turn and with which we shall conclude.

Implications

These have primarily been studies of the inquiry process. Though simulations of problems confronting teachers were employed, the purpose of the research was not development of a theory of teaching behavior. Instead we wished to study the general process of which teaching may be a specific exemplar, inquiry.

It is no accident that the terms used to describe seeking styles, dialectical and didactic, can also describe styles of teaching. We have reason to believe that were studies conducted of the actual teaching behavior of subjects classified as dialectical or didactic we would find major differences in their instructional behavior. We believe that dialectical teachers would teach more readily via inquiry, raising questions, juxtaposing opposing points of view and pulling together many different sources of information.

Would exposure to dialectical teachers make children more dialectical? Gallagher (1965) has reported that divergent thinking in teachers elicits divergent thinking in their pupils. Yando and Kagan (1968) report that the pupils of experienced reflective teachers became more reflective. It would therefore stand to reason that dialectical teachers would have parallel effects on their pupils. But 'reason' is insufficient evidence for the behavioral sciences. This is a question demanding an empirical answer.

A better understanding of the inquiry process can also aid in our understanding of learning by discovery. This is an issue that has been argued about heatedly for a dozen years (Shulman and Keislar, 1966). We see the processes of inquiry and discovery as very similar. Discovery takes place under conditions where individuals are confronted by situations or propositions that do not fit with their currently held cognitive models. Either the new situation must be denied or distorted, or the individual must modify his existing cognitive structure to accomodate the new situation. This change in cognitive structure is what is involved in learning by discovery.

The teacher who wishes to encourage pupil discovery constructs learning conditions which force the learner to confront events which will challenge or contradict beliefs he already holds. It is clear that the conditions for discovery and the setting for inquiry are quite similar. Both involve initiation of a dialectic, either interpersonal or internal.

Most research on discovery learning has focused either on the conditions which precede it or the consequences flowing from it. Our research studies the very process of discovery itself. We believe that research on the processes of inquiry can enable us to understand it and, hence, instruct others in it.

Implicit in research on inquiry is a particular theory of transfer of training. Those of us who study inquiry as a general process subscribe to a very broad and general theory of transfer of training. That is, we suggest that general strategies of problem sensing, formulating, and searching are learned by individuals and then transferred broadly across very different problem domains. Such a conception of transfer also inheres in the notion of a cognitive style. Furthermore, most advocates of learning by discovery assert that the discovery learning methods teach students broad strategies of knowledge-getting. They claim that through learning *by* discovery a student will learn *to* discover--that is, he will acquire general inquiry competencies. At present this assertion stands untested. It is one of the most important future areas to which our empirical investigation of inquiry must turn.

Time is an important factor for inquiry. In our research amount of time expended may have been the most important prerequisite to inquiry effectiveness. The research of Allender (1968) provides additional evidence for this conclusion. Allender gave elementary school as much time as they needed to work through a simulation entitled *I Am The Mayor*, an inquiry situation dealing with the problems of administering the business of a simulated small town. When he divided his sample into those who had expended more time and those who had expended less, the group inquiring longer was found to be superior on measures of problem sensitivity, problem formulation and search.

The emphasis in our schools today is most often on speed of response rather than extension of response sequence. If a goal of education is the teaching of inquiry skills, then we must instruct our children to delay, ponder and weigh alternatives. Engaging in the inner dialogue of dialectic takes time. It is the essence of *mediation* to interpose thought between impulse and action. The mediated response cannot be *im-mediate*. When proposing to teach for inquiry the schools must remain mindful of this principle and not penalize the child who would take the time to inquire.

The general approach used in this research holds promise for future studies of such complex skills as teaching and medical diagnosis. A major research need in these areas is for careful descriptive studies of the behavior of criterial exemplars of those skills. Observation of outstanding teachers working with tasks such as the Teacher's In-Basket can help us develop a model of pre-active teaching. Analysis of the behavior of criterial physicians will lead to a better understanding of the processes of medical diagnosis. By bringing to bear the techniques of simulation and systematic introspection many such important but difficult to study areas of human endeavor can be investigated.

Systematic study of any phenomenon must somehow freeze it in place, dissect it, classify the pieces and make sense of the relations among the parts. In so doing, we often make the dynamic appear static, the fluid appear stable and the continuous appear discrete. Without such distinctions no research would be possible. Were the world truly so fractionized it would surely crumble.

We have studied inquiry because it has intrinsic importance for us as a species. Animals adapt. They learn. They modify their behavior in reaction to contingencies which arise to confront them. But they do not inquire. They cannot coordinate images, plans, the invention of multiple means and the evaluation of alternative ends. Only man can inquire. With language, it is probably his most human characteristic.

What then is this process of inquiry which we have analyzed so assiduously in this report? It is best described in the words chosen by Bridgman to characterize the scientific method. What is inquiry?

> " . . . doing one's damnedest with one's mind, no holds barred."

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APPENDIX A

Appendix A includes:

(1) the role-setting materials read by each subject before the beginning work on the in-basket

(2) description and map of the Ridge Forest community

(3) a listing of the contents of in-basket form B

The date is December 6, 1965. It is a Teacher's Record Day, so there are no children--only the faculty and administration. You are sitting in Room 207 of the Jefferson Elementary School. You have just been hired to be the new teacher of the 6th Grade which meets in this room. The former teacher, Miss Todd, died October 21. Since then the class has been taught by a succession of substitutes. You graduated from college in August and this is your first permanent teaching job.

When you came in this morning, Mrs. Morrison, the principal's secretary, told you that there were many things that had piled up on the 6th Grade teacher's desk over the course of the past weeks, and this being Record Day was the best opportunity to catch up on them. She said that she realized how difficult some of the things would be to do since you had not yet seen the children; yet, due to many impending deadlines, she would appreciate it if you did as much as you could. She emphasized the fact that both she and Dr. Maxwell, the principal, would be available to assist with any information or records you would need.

Please act in this situation exactly as you would were you really this teacher. You have at your disposal all the resources in this room just as you would if this were in fact your classroom, plus any resources that you can use that can be supplied by Mrs. Morrison whom you can call by intercom. Use anything and everyone you can in the pursuit of your teacher's activities.

The intercom on your desk connects you *only* with Mrs. Morrison, the secretary. She in turn, can connect you with the "reference memory" (see page 2), or take any messages for Dr. Maxwell or other school personnel. She will contact the others and return to you their responses. Any outside phone calls you may wish to make will be made for you by the secretary. You should dictate all letters or lists to the secretary over the intercom. Use the intercom by pushing the lever down to talk and release it to listen.

In the interests of the study being conducted, it is imperative that *all of your thoughts* in this situation be made verbal. That is, *think aloud* during this entire period. Nothing is too trivial to be said aloud. Keep talking all the time! At such a time as you stop thinking aloud, you will hear a buzzer emit two or three very short buzzes. This is a reminder to you to resume your thinking out loud. The success of this research depends largely on your ability to make your thoughts available to yourself and to the observer.

Welcome to Jefferson School and to Ridge Forest.

The following materials are available to the teacher:

IN THIS ROOM

Current report cards for each student

Current achievement and aptitude records for each student on yellow cardexes

Current Attendance Book

Anecdotal records and discipline slips for selected students

Contents of the in-basket

FROM THE OFFICE

Cumulative Record Folders from time of entrance into system for each student, containing special help, family data, and test results.

Free advice from the office.

FROM THE NURSE'S OFFICE

Medical records from time of entrance into system for each student.

FROM YOUR "REFERENCE MEMORY"

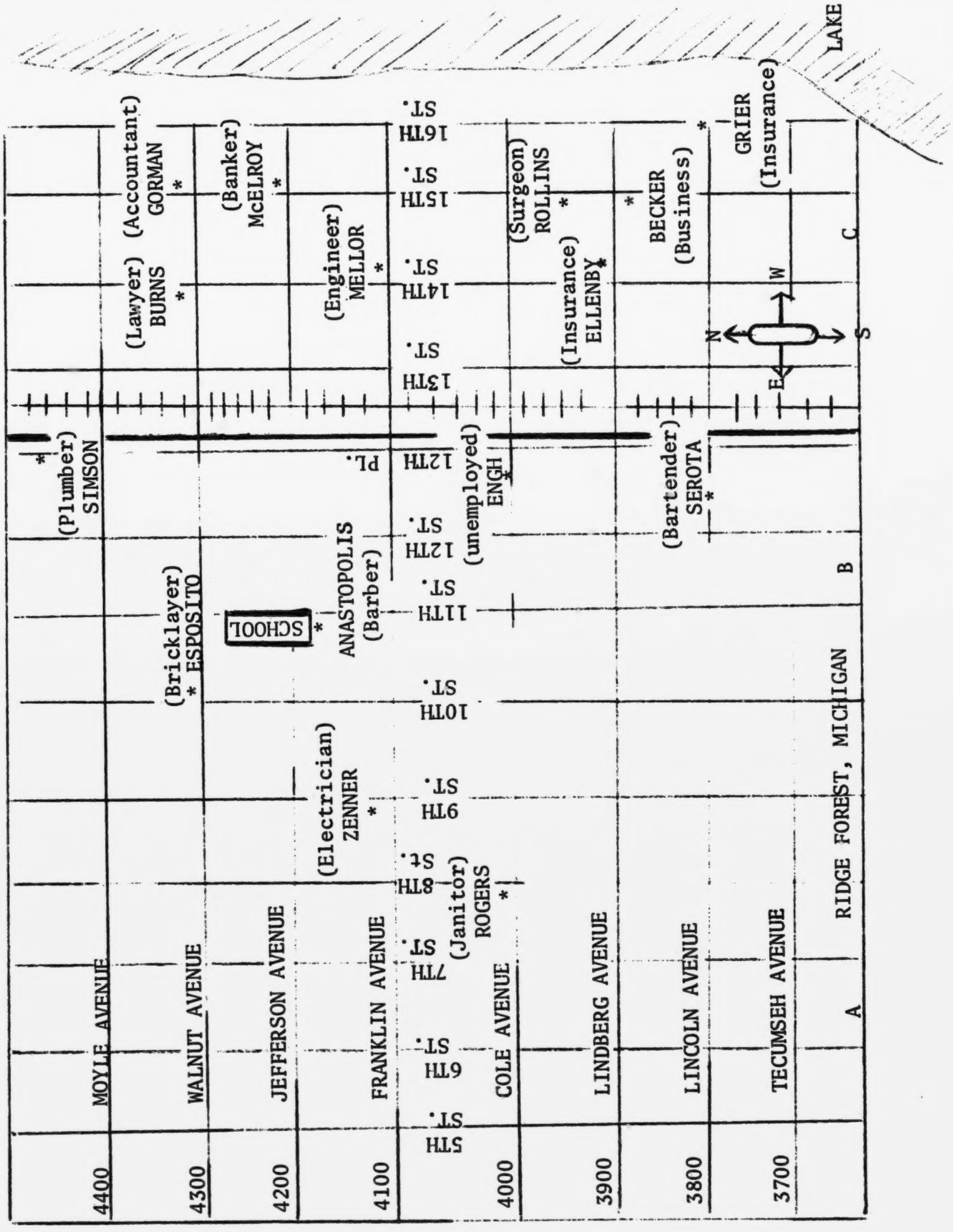
The purpose of including a "reference memory" in this situation is to provide as much help as possible to the teacher. The reference memory "knows" everything that is in the Teacher's Handbook about school policy and testing methods and scores, etc. "Reference" can also inform the teacher of any experiences, meetings, interviews, scuttlebut, etc., that she might have undergone previously. When in doubt whether to seek information from your reference memory or not, go ahead and call. If "reference" cannot help you, it will inform you of that, and you can then turn to other alternatives. To consult with "reference," call the secretary on the intercom and ask for "reference, please."

THE RIDGE FOREST COMMUNITY

The Jefferson Elementary School District encompasses 77 square blocks in the Ridge Forest Community. Its boundaries are 5th Street on the north; the Lake on the south; Moyle Avenue to the west; and Tecumseh Avenue to the east. Ridge Forest has a population of 18,000 people with five elementary schools, of which Jefferson is the newest.

The history of Ridge Forest goes back approximately 75 years, when it was first settled by upper-middle class Detroiters who were attempting to escape from the grime and noise of the city. The growth in population of Ridge Forest about the turn of the century was directly traceable to the extension of the suburban railroad line out through Ridge Forest, thus providing easy access for businessmen commuting to the city daily to their work. Ridge Forest remained essentially an upper-middle class community until immediately after World War II, when its population doubled in a period of ten years. The source of this population increment was an influx of lower-middle class and upper-lower class Detroiters moving into newly constructed lower-priced houses or the newly zoned multiple unit dwellings to the east of the railroad tracks. It was this influx that caused the need for the building of Jefferson School at its present location in 1954.

The newest residents of the school district occupy a small, eight-square block area in the far southeast corner of the suburb. These include two distinct groups: one is a growing, Spanish-speaking population, which has crossed over from the adjoining Detroit border, and which generally works either in Detroit or as domestics for Ridge Forest residents living between the railroad and the Lake; and a less readily classified group of residents who have been attracted by the newly erected Art Museum and College at Lincoln and 5th. This third area reaches from Tecumseh to Franklin and from 5th to 7th. There are thus three easily distinguishable socio-economic groups inhabiting our school district and divided geographically. For purposes of identification, your map on Page 1 is thus divided into Area *A* (which is the newest area); Area *B* (the lower-middle class and upper-lower class residents live); and Area *C* (where the older families and the more well-established families in the school district live).


LAKE
RIDGE FOREST, MICHIGAN
A
B
C
N
S
E
W
MOYLE AVENUE
WALNUT AVENUE
JEFFERSON AVENUE
FRANKLIN AVENUE
COLE AVENUE
LINDBERG AVENUE
LINCOLN AVENUE
TECUMSEH AVENUE
4400
4300
4200
4100
4000
3900
3800
3700
5TH ST.
6TH ST.
7TH ST.
8TH ST.
9TH ST.
10TH ST.
11TH ST.
12TH ST.
12TH PL.
13TH ST.
14TH ST.
15TH ST.
16TH ST.
SCHOOL
(Plumber) SIMSON
(Lawyer) BURNS
(Accountant) GORMAN
(Banker) McELROY
(Engineer) MELLOR
(Bricklayer) ESPOSITO
ANASTOPOLIS (Barber)
(Electrician) ZENNER
(Janitor) ROGERS
(unemployed) ENGH
(Surgeon) ROLLINS
(Insurance) ELLENBY
BECKER (Business)
(Bartender) SEROTA
GRIER (Insurance)

CONTENTS OF IN-BASKET FORM B

B- 1. Brief description of Ridge Forest school district and major characteristics of the community. Gives SES breakdown of the different areas in the community. Map of community on which student's residences are indicated. Calendar indicating the date is December 6, 1965.

B- 2. Memorandum from Mr. Norton (principal) with an attached field trip permission slip, indicating that this is Stu Sieminsky's third slip and if not returned he cannot participate in the field trip.

B- 3. Class schedule with attached note indicating that William Moore and David Rosen will be excused for band twice a week (during math class).

B- 4. Sociogram, dated October 20, 1965.

B- 5. Letter from Mrs. Moore expressing concern over William's dropping grades in arithmetic and asking for an appointment.

B- 6. Memorandum for the Principal indicating that the school psychologist is coming December 13 and December 6 (today) is the deadline for submitting referrals. Referrals should include teachers hunches about what problem is.

B- 7. Sheet with scores of students in class on the California Test of Personality. Attached, some rough guidelines for interpretation.

B- 8. Phone memo, "William's mother called" indicating her concern over a cross burned in their yard and inquiring about his recent social relationships with his classmates.

B- 9. Letter to Mrs. Forbes from Mrs. Cooper asking her to invite class to a birthday party for Margie on December 15 and let her know how many to expect. Attached, a sign up sheet with three names and a note from Mrs. Forbes indicating it was posted for one week.

B-10. Memorandum from the Principal requesting the names of students to be referred for special enrichment or remediation sections.

B-11. Memorandum from school nurse noting Stu has come to school bruised and possibly beaten; requests more information.

B-12. Class newspaper containing list of class officers, activities, jokes, poetry, etc.

B-13. Memorandum from the school nurse indicating that Margaret Cooper has been leaving class on Fridays complaining of cramps. Might be an excuse for something else.

APPENDIX B

Included in Appendix B are excerpts from the scoring manuals for in-baskets A and B, the scoring keys for competence of problems resolution for in-baskets A and B, and a sample tally sheet for scoring information sources.

EXCERPT FROM MANUAL FOR IN-BASKET A

Catherine Serota

0. General
    a. Remedial?
    b. Psychologist?

1. R.C.
    a. Failing grades
    b. Unsatisfactory deportment
    c. Tardy somewhat
    d. Underachiever--grades and IQ

2. Cardex
    a. IQ is 139
    b. Very low achievement scores
    c. Mother's name Tillie or Susan
    d. Underachiever--Ach. scores and IQ

3. Cum File
    a. Previously high achievement drops off suddenly in 3rd grade
    b. Satisfactory deportment drops in 3rd grade
    c. Parents in tavern working
    d. Low parent education

4. Rec. Book--none

5. CTP
    a. 3 in school relations

6. Sociogram
    a. Isolate

7. Medical--none

EXCERPT FROM MANUAL FOR IN-BASKET B

William Fagen

0. General
   a. Related to Mary Beth
   *b. Is he a Negro?
   c. Stepsister doing well by comparison
   d. Remedial?
   e. Psychologist?

1. R.C.
   a. Very poor grades
   b. Unsatisfactory deportment
   c. Signed by Graves
   *d. Absent and tardy a great deal

2. Cardex
   a. CTMM test given in 6/54
   b. He transferred from Detroit
   c. Both parents work
   d. Achievement scores are low
   e. Mother remarried
   f. Low IQ (85)

3. Cum File
   a. Never been a good student
   b. Good attendance in the past

4. Rec. Book
   *a. Numerous absences and tardies

5. CTP
   a. Scored 82
   b. Low subscores

6. Sociogram
   *a. Mutual choice with Terry
   *b. Chosen by Mary Beth

7. Medical
   a. Underweight and short
   b. No big weight gain since 1961

8. Anecdotes
   *a. Who is B. H.
   b. Misspelled his name
   *c. William beat up Terry--who is his best friend
   d. Neither would say why it happened
   e. What happened at principal's office

*Problem is embedded in more than one place. Can be scored only once

EXCERPT FROM MANUAL FOR IN-BASKET B

Mary Beth Graves

0. General
    - *a. Talking to Cristina

1. R.C.
    - a. U in self-control at first period

2. Cardex
    - a. Has a stepmother

3. Cum File
    - a. Class officer in past

4. Rec. Book--none

5. CTP--none

6. Sociogram
    - a. Socio-center
    - *b. Chooses William Fagen for first choice

7. Medical
    - a. Mother died of cancer 1962

8. Anecdote
    - a. Relationship with Negro
    - b. Not signed

*Problem is embedded in more than one place. Can be scored only once

A
SCORING KEY FOR COMPETENCE (SOLUTION)

	1	2	3	4	5
Grier	Fine Student	Low-CTP subscore, anecdote about crying etc., i.e., adjustment problems, contrasted with being a good student	She might have future problems because she moves around alot.	Past grades fluctuate because of moving.	Father's absent related to grade fluctuation
Engh	Failing grades, low CTP, anecdote & relating 2 or more of the above	Relates father's unemployment to problems.	Noting past neurologican condition and how it may relate to present. Was out of school etc.	Father's unemployment arouses neurological problem --epilepsy.	No money to buy medicine he needs.
Simson	Low CTP on low grades	Discrepancy of IQ & grades or achievement	Relate problems to broken home	See current problem in perspective of past. Did well until divorce. Now does poorly.	Strong identification with own father as reflected in A+ in math. Home situation affects him socially, emotionally, and academically.

SCORING KEY FOR COMPETENCE A (Cont.)

	1	2	3	4	5
Gorman	Any action on basis of picture alone	Borderline CTP, high otherwise. May need some help or can disregard.	Has older brothers & has overheard them talk.		
Ellenby-Zenner	Either Gloria because the other isn't seen	Intermediate, Search but no solution. 2 Glorias or "search" for one	It's Ellenby because she has a D on RC and Zenner has an A.		
Becker-Rollins Calls	No conflict seen. Makes decision.	They conflict - make arbitrary choice like who called first	Comparison of Becker & Rollins as students as basis for decision	3+ sociometric first choices and professional simularities.	4+ notes that they are next door neighbors.
Rollins	Brightest kid in class - consider for acceleration	Discrepancy between CTP & academic record	Related academic and social life in terms of possible parental pressure (invitation) or her age.	From cumulative record. Parents pushing her. Might be ready academically but not socially. Youngest in class	

SCORING KEY FOR COMPETENCE A (Cont.)

	1	2	3	4	5
Serota	Low grades or isolate	Discrepancy of grades or sociogram with high IQ	Parents in tavern not motivated to succeed in school		Influence of home more apparent recently. Did well as early elementary student.
Burns	Average to low grades. Always late. Has Chauffer. Parents in Europe.	Confused scores on cardex or absent & tardy a lot	CTP - poor in family relations. Underachiever, not motivated in school, because of family relations.	Neglected by parents in relation to *all* other information.	

B
SCORING KEY FOR COMPETENCE (SOLUTION)

	1	2	3	4	5
Lopez	Low RC low cardex low CTP (to psychologist) almost isolate	Migrant. Transfer student absent & tardy.	Intelligent IQ 151 but an underachiever. May have language problem.	Illiterate parents Sh's so smart. Low educated parents.	School not valued in her home so lacks motivation.
Fagen	Low RC, low achievement scores, low CTP not popular. To psychologist or remediation.	Absent & tardy - dissatisfied with school. Transferred from Detroit.	Unstable family, divorce, remarriage	Stepsister in same class	Frustrated - can't compete stepsister Emotional and family problems.
Sieminsky	Low RC. Absent for CTP, No field trip slip in. Popular	Behavior problem and yet popular. Disrupts class	Unstable family - father diserted and returned, parents quarrel	Discrepancy between parent's education. Home problems in relation to RC and good art grade	Parents compete, Father aggressive with Stu. Stu identifies with Mother. Fears Father - beaten by Father.
Hoffman	Poor RC - low CTP & low subscore	Grades discrepant with IQ (underachiever) Sociogram isolate	Emotional problems; low CTP, isolate sister coming	Stuttering - connected with emotional problems.	Sister is a star - can't compete. Home pressure getting worse because of sister's visit.

SCORING KEY FOR COMPETENCE B (Cont.)

	1	2	3	4	5
Fagen-Moore	Either one because other isn't seen. Negro in class - "crossburned, Nigger Lover"	2 William's	Graves and Fagen are brother & sister (either result o.k.)	Lives in integrated neighborhood Moore is Negro - has lived here a longer time.	
Rosen	RC excellent, CTP high, President of class	Bored - causes disorder. Sociogram: popular. Enrichment needed	Excellent in everything, not accelerated - strange. Small - thin boy.		
Maloney	Low RC - except reading. Same for achievement - reading high. Low CTP. Overweight	Overweight, low CTP, D in Phys. Ed. Sociogram dyad.	*Emotional problems* connected with overweight. High reading grade - maybe reads a lot alone		
Moore (Math)	Give extra help in math from anecdote about math	Other grades o.k. "D" in math	Band meets same time as math.		
Cooper	Birthday, only 3 signed up	Won games day. RC A's in Phsycial Ed. Socio: isolate	Youngest in class. Sociogram & CTP discrepant. Ill Fridays. Has all brothers.	Misses dancing regularly/not popular. Socially immature - not too feminine in her role.	

SOURCES OF INFORMATION USED

Major Problems	Report Card	Cardex	Attendance Book	Anecdote	CTP	CTP Sub-Scales	Sociogram	Permanent File	Medical Record	Secretary	References	Map	In-Basket	Total	Comments
1. Grier															
2. Engh															
3. Simson															
4. Gorman															
5. Gloria (Ellenby or Zenner)															
6. Becker-Rollins Calls															
7. Acceleration															
8. Adele Rollins															
9. Catherine															
10. Burns															

APPENDIX C

Appendix C contains certain selected tests and scales which may not be familiar to the reader.

EXCERPT FROM MSU READING TEST

But in all politics we observe two sources of decay existing from natural causes, the one external, the other internal and self-produced. The external admits of no certain or fixed definition, but the internal follows a definite order.

When a commonwealth, after warding off many great dangers, has arrived at a high pitch of prosperity, and undisputed power, it is evident that, by the continuance of the great wealth within it, the manner of life of its citizens will become more extravagant; and the rivalry for office, and in other spheres of activity, will become fiercer than it ought to be. And as this state of things goes on more and more, the desire of office and the shame of losing reputation, as well as the ostentation and extravagance of living, will prove the beginning of deterioration. And of this change the people will be credited with being the author, when they become convinced that they are being cheated by some from avarice, and are puffed up by flattery from others from love of office. For when that comes about, in their passionate resentment and acting under the dictates of anger, they will refuse to obey any longer, or be content to have equal powers with their leaders, but will demand to have all or far the greatest themselves. And when that comes to pass the constitution will receive a new name, which sounds better than any other in the world, liberty or democracy; but, in fact, it will become the worst of all governments, mob-rule.

38. Which of the following best describes the author's concept of history?

    1. The golden age--all history is a decline from some perfect period.
    2. The cyclical--nations develop and then decay.
    3. The progressive--nations continue to improve.
    4. The static--nations do not change.

39. According to the passage, the ultimate authority ot government derives from

    1. aristocratic leaders.
    2. wealthy landowners.
    3. ordinary people.
    4. virtuous men.

40. The writer states that internal corruption might finally lead to

    1. anarchy.
    2. fascism.
    3. communism.
    4. all of the above.

41. Which of the following might be called an "external source" of decay?

    1. Citizens demanding universal suffrage
    2. Conquest by a rival power
    3. Disputes among rival politicians
    4. Mob-rule by the masses

ATTITUDE INVENTORY

This questionnaire is composed of 50 statements with which you will be asked to agree or disagree. For each statement, respond according to the following key:

(1) True

(2) False

Please proceed through the inventory quickly, and respond to every item.

Items preceded by (F-S) are part of the Focus-Scan Scale; those preceded by (E-D) are part of the Education Scale; those preceded by (L-D) are part of the Lecture-Discussion Scale. All other items are from the Complexity Scale.

1. I like to have a place for everything and everything in its place.

(F-S) 2. I often start writing the answer to an essay question and find I've written myself into a corner.

3. Some of my friends think that my ideas are impractical, if not a bit wild.

(F-S) 4. I cannot skim reading material; I must examine each word and sentence.

5. I don't like to undertake any project unless I have a pretty good idea how it will turn out.

(F-S) 6. In reading, I try to master each idea before passing on to the next.

7. For most questions there is just one right answer, once a person is able to get all the facts.

(F-S) 8. When text material is too difficult for me, I try to grasp whatever I can and at least try to get the big picture.

9. Politically I am probably something of a radical.

(F-S) 10. I am better at getting the main ideas of a lecture than at remembering the details.

11. Perfect balance is the essence of all good composition.

(F-S) 12. I find it pleasant and easy to skim a chapter in a book and pick out the major points.

13. I prefer to engage in activities from which I can see definite results rather than those from which no tangible or objective results are apparent.

(ED) 14. The first duty of a teacher is to cover the subject material adequately.

15. I find that a well-ordered mode of life with regular hours is not congenial to my temperament.

(ED) 16. Too much emphasis has been put on new curricula lately, and not enough on ways to improve the self-concepts of our youngsters.

17. The unfinished and the imperfect often have greater appeal for me than the completed and the polished.

(ED) 18. Schools of today are neglecting reading, writing, and arithmetic; the three R's.

19. I like to listen to primitive music.

(ED) 20. Our objective should be to teach children, not subject matter.

21. I have always had goals and ambitions that were impractical or that seemed impossible for me to realize.

(ED) 22. The curriculum should be made up of an orderly sequence of subjects that teach to all students the best of our cultural heritage.

23. When a teacher lectures on something other than what he originally announced, I feel uneasy.

24. Trends toward abstractionism and the distortion of reality have corrupted much art of recent years.

25. It bothers me to have different news commentators give different interpretations of the news.

(ED) 26. Learning is essentially a process of increasing one's store of information about the various fields of knowledge.

(L-D) 27. The sign of a good teacher is the ability to teach a class spontaneously, without careful preparation.

28. I like to fool around with new ideas, even if they turn out later to have been a total waste of time.

29. I don't like to work on a problem unless there is a possibility of coming out with a clear-cut unambiguous answer.

(ED) 30. One of the big difficulties with modern schools is that order and discipline are often emphasized at the expense of the personal development of the students.

31. I have always hated regulations.

(L-D) 32. The give-and-take of a class discussion is usually much more rewarding than a lecture.

33. Many of my friends would probably be considered unconventional by other people.

(L-D) 34. I like classes in which notes can be easily taken.

35. It doesn't bother me when things are uncertain and unpredictable.

(L-D) 36. Nothing is more infuriating than an instructor who jumps around among topics and never sticks to the point.

37. My way of doing things is apt to be misunderstood by others.

(L-D) 38. I value courses that provide an abundance of meaningful factual material.

39. Facts appeal to me more than ideas.

(L-D) 40. Small discussion groups often leave me with a feeling of dissatisfaction concerning the way time was spent.

41. I have had strange and peculiar thoughts.

(ED) 42. No subject is more important to a teacher than the personalities of the pupils.

43. I don't like things to be uncertain and unpredictable.

44. The worst thing an instructor can do is to make very specific plans for each lesson.

45. It is a good rule to accept nothing as certain or proved.

46. I dislike following a set schedule.

47. Usually, I prefer known ways of doing things rather than trying out new ways.

48. I like to go alone to visit new and strange places.

49. I much prefer friends who are pleasant to have around to those who are always involved in some difficult problem.

50. I have had very peculiar and strange experiences.

The Marlowe-Crowne Social Desirability Scale was used as a measure of defensiveness. The Alpert-Haber Test Anxiety Scale served as our measure of test anxiety. The two scales were combined into a single 52-item scale for administration. They are separated here for easier reference.

THE MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE

Instructions: Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is *true or false* as it pertains to you personally.

1. Before voting I thoroughly investigate the qualifications of all the candidates. (T)*
2. I never hesitate to go out of my way to help someone in trouble. (T)
3. It is sometimes hard for me to go on with my work if I am not encouraged. (F)
4. I have never intensely disliked anyone. (T)
5. On occasion I have had doubts about my ability to succeed in life. (F)
6. I sometimes feel resentful when I don't get my way. (F)
7. I am always careful about my manner of dress. (T)
8. My table manners at home are as good as when I eat out in a restaurant. (T)
9. If I could get into a movie without paying and be sure I was not seen I would probably do it. (F)
10. On a few occasions, I have given up doing something because I thought too little of my ability. (F)
11. I like to gossip at times. (F)
12. There have been times when I felt like rebelling against people in authority even though I knew they were right. (F)
13. No matter who I'm talking to, I'm always a good listener. (T)
14. I can remember "playing sick" to get out of something. (F)
15. There have been occasions when I took advantage of someone. (F)
16. I'm always willing to admit it when I make a mistake. (T)
17. I always try to practice what I preach. (T)
18. I don't find it particularly difficult to get along with loud mouthed, obnoxious people. (T)
19. I sometimes try to get even rather than forgive and forget. (F)
20. When I don't know something I don't at all mind admitting it. (T)
21. I am always courteous, even to people who are disagreeable. (T)
22. At times I have really insisted on having things my own way. (F)
23. There have been occasions when I felt like smashing things. (F)
24. I would never think of letting someone else be punished for my wrongdoings. (T)
25. I never resent being asked to return a favor. (T)
26. I have never been irked when people expressed ideas very different from my own. (T)
27. I never make a long trip without checking the safety of my car. (T)
28. There have been times when I was quite jealous of the good fortune of others. (F)
29. I have almost never felt the urge to tell someone off. (T)
30. I am sometimes irritated by people who ask favors of me. (F)
31. I have never felt that I was punished without cause. (T)

* Keyed in the high defensiveness direction.

32. I sometimes think when people have a misfortune they only got what they deserved. (F)
33. I have never deliberately said something that hurt someone's feelings. (T)

ALPERT AND HABER TEST ANXIETY SCALE

Facilitating Anxiety Scale

1. I work most effectively under pressure, as when the task is very important. Always - Never.
2. While I may (or may not) be nervous before taking an exam, once I start, I seem to forget to be nervous. I always forget - I am always nervous during an exam.
3. Nervousness while taking a test helps me do better. It never helps - It often helps.
4. When I start a test, nothing is able to distract me. This is always true of me - This is not true of me.
5. In courses in which the total grade is based mainly on *one* exam, I seem to do better than other people. Never - Almost always.
6. I look forward to exams. Never - Always.
7. Although "cramming" under pre-examination tension is not effective for most people, I find that if the need arises, I can learn material immediately before an exam, even under considerable pressure, and successfully retain it to use on the exam. I am always able to use the "crammed" material successfully - I am never able to use the "crammed" material successfully.
8. I enjoy taking a difficult exam more than an easy one. Always - Never.
9. The more important the exam or test, the better I seem to do. This is true of me - This is not true of me.

Debilitating Anxiety Scale

1. Nervousness while taking an exam or test hinders me from doing well. Always - Never.
2. In a course where I have been doing poorly, my fear of a bad grade cuts down my efficiency. Never - Always.
3. When I am poorly prepared for an exam or test, I get upset, and do less well than even my restricted knowledge should allow. This never happens to me - This practically always happens to me.
4. The more important the examination, the less well I seem do to. Always - Never.
5. During exams or tests, I block on questions to which I know the answers, even though I might remember them as soon as the exam is over. This always happens to me - I never block on questions to which I know the answers.
6. I find that my mind goes blank at the beginning of an exam, and it takes me a few minutes before I can function. I almost always blank out at first - I never blank out at first.
7. I am so tired from worrying about an exam, that I find I almost don't care how well I do by the time I start the test. I never feel this way - I almost always feel this way.

8. Time pressure on an exam causes me to do worse than the rest of the group under similar conditions. Time pressure always seems to make me do worse on an exam than others - Time pressure never seems to make me do worse on an exam than others.
9. I find myself reading exam questions without understanding them, and I must go back over them so that they will make sense. Never - almost always.
10. When I don't do well on a difficult item at the beginning of an exam, it tends to upset me so that I block on even easy questions later on. This never happens to me - This almost always happens to me.

CLOSURE-FLEXIBILITY SCALE

The Closure-Flexibility Scale is a measure of field independence. The task set for the subject is to compare the model figure given on the left to each of four figures on the right and decide for each separately whether it contains the model figure. Closure-Flexibiltiy is scored by the total number correct and the total number tried. Only the total correct score was interpreted in the body of this report.

GENERAL INVENTORY

The General Inventory was used to derive measures of socioeconomic status and political preference. Items 2-4 were used to gain social status information based on parental occupation and education. Scores on items 6-8 were pooled into the politics score (scored in the liberal direction). The rest of the General Inventory items were not used in the analysis.

GENERAL INVENTORY

1. Were you raised in a predominantly

    a. Urban area
    b. Suburban area
    c. Small town
    d. Rural area

    (If you moved around alot, select the the alternative respresenting where *most* of your childhood was spent.)

2. What is (or was) your father's occupation?

    a. Professional (except teacher; e.g., doctor, lawyer, accountant, etc.)
    b. Teacher
    c. Self-employed businessman
    d. Farm owner
    e. Skilled tradesman (carpenter, plumber, etc.)
    f. White collar (clerical, sales, etc.)
    g. Industrial worker
    h. Other (explain) ____

3. How many years of schooling did your father have?

    a. 1-8
    b. 9-11
    c. High school graduate
    d. Some college or trade school
    e. College graduate
    f. Post-graduate or professional training

4. How many years of schooling did your mother have?

    a. 1-8
    b. 9-11
    c. High school graduate
    d. Some college or trade school
    e. College graduate
    f. Post-graduate or professional training

5. What is the highest educational level attained by older brothers or sisters in your family?

    a. I have no older brothers or sisters
    b. 1-8
    c. 9-11
    d. High school graduate
    e. Some college or trade school
    f. College graduate
    g. Post-graduate or professional training

6. To the best of your knowledge, what are (were) the predominant political learnings of your parents?

   a. Democratic
   b. Republican
   c. Independent
   d. Other (specify) ____________________

7. Politically speaking, would you consider yourself:

   a. Quite conservative
   b. Somewhat conservative
   c. Middle-of-the-road
   d. Somewhat liberal
   e. Quite liberal

8. Rank your own personal preference for the following political figures, were they all to be candidates for the presidency in the same election. Rank from 1-4.

   Barry Goldwater
   George Romney
   Lyndon Johnson
   Robert Kennedy

9. Were you affiliated with a sorority (or fraternity) while in college?

   Yes __________
   No __________

10. If yes, how well did you like being a "Greek?"

    a. Most enjoyable and worthwhile part of campus life
    b. Pretty enjoyable and worthwhile
    c. So-so
    d. It's really not very exciting

11. We all differ with respect to study habits. Choose the description which most closely approximates your *own* pattern when you were a college student.

    a. I tend to stay reliably up to date on reading and writing assignments.
    b. I try to stay up to date but usually find that I fall behind.
    c. I tend to consistently stay up to date on certain types of tasks and fall behind on other types.
    d. I usually wait until the last possible moment and then cram like mad.
    e. I usually wait until the last moment and then often do not complete my work.

12. In the following, circle *one* alternative within each set of parentheses. In general, when I was a student, I perceived myself as someone who received (good, average, poor) grades by working (very hard, fairly hard, not very hard).

13. When you used to sit down to take a long, multiple-choice final examination, what was the *first* thing you usually did?

    a. Begin answering the first item and continue straight through the test.
    b. Scan and begin where things look easy or interesting.
    c. Scan the whole thing and then go back to the beginning and answer through.
    d. Scan the whole test and then decide how to begin.

14. It is expected and understandable that all teachers have concerns about their teaching effectiveness. A number of things that typically concern teachers are listed below. Place a *1* next to the item that concerns *you* most; a *2* next to the one that is the second most concerning for you, etc., until you have ranked all 5.

    ____ I worry about whether I know my subject matter well enough to keep up with and challenge the brighter students in my class.

    ____ I worry about whether I will be capable of maintaining discipline in the class, especially among the rowdier elements.

    ____ I worry about whether my students will like me personally as much as I would hope them to.

    ____ I worry about whether I can cope with the emotional problems that might be found in my class.

    ____ I worry about whether I will be sufficiently calm in front of my class.

WORD ASSOCIATION

Listed below are twenty-five words that have more than one meaning. In the space following each word, you should write down as many of the meanings as you can. The meanings need not be written out in full; writing down one word will usually do. For example:

BARK tree, dog, seal, boat

These four words bring to mind three different meanings for the word BARK: the outer covering of a tree; a certain noise made by some animals like dogs and seals; and a kind of boat. Notice that the meanings were not written out in full; only some words to *remind* us of these meanings were given. This is all you have to do.

Your score will depend both on the number of different words you write (in the example above this was four) and on the number of different meanings the words remind us of (in the example above this was three). So if you had time to write only two words for BARK, you would choose *tree* and *dog* say, rather than *dog* and *seal* because the former words stand for two meanings, but the latter words stand for one meaning.

When you are sure of what you are to do, you may begin.

1. ARM
2. BIT
3. BOLT
4. CAP
5. COIL
6. DUCK
7. FAIR
8. FAST
9. FILE

10. GRAVE

11. HOST

12. LEAF

13. MORTAR

14. PINK

15. PITCH

16. PLANE

17. POKE

18. POLICY

19. PORT

20. PUNCH

21. RAKE

22. SACK

23. STRAND

24. TACK

25. TENDER

INVENTORY OF BELIEFS

Form T

This inventory consists of 100 statements which range over a wide variety of topics. As you read each statement you are asked to indicate quickly your agreement or disagreement with it in terms of the key given at the top of each page. People have different reactions to these statements. This is not a test in which there are "right" or "wrong" answers. What is wanted here is your own quick personal reaction. You should be able to finish taking the inventory in 20 minutes or less.

In responding to these statements you will notice that there is no way provided for indicating a neutral position. It is desired that you indicate a tendency toward either agreement or disagreement even though you may prefer to remain undecided. It is important that you respond to every one of the 100 statements.

When the proctor gives the signal, open your examination booklet and begin work. The key you are to use is reproduced at the top of each page. Note that you will never use the *E* response on your answer sheet.

Adapted in part from the Inventory of Beliefs copyrighted by the Cooperative Study of Evaluation in General Education of the American Council on Education, 1951.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

1. Literature should not question the basic moral concepts of society.
2. The main thing about good music is lovely melody.
3. Lowering tariffs to admit more foreign goods into this country tends to raise our standard of living.
4. When things seem black, a person should not complain, for it may be God's will.
5. Science is infringing upon religion when it attempts to delve into the origin of life itself.
6. Literature which questions the basic moral concepts of our society is good.
7. In our present society only a wartime economy can provide full employment.
8. A man's conscience is an unreliable guide to right and wrong.
9. No task is too great or too difficult when we know that God is on on side.
10. A work of art which provides only entertainment is useless.
11. A person gets what's coming to him in this life if he doesn't believe in God.
12. Young people today are in general more immoral and irresponsible than young people of previous generations.
13. More playgrounds and fewer strict fathers would eliminate juvenile delinquency.
14. The many different kinds of children in school these days force teachers to make a lot of rules and regulations so that things will run smoothly.
15. Organized labor has done more to further economic progress than business and industry.
16. Poverty can be eliminated.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

17. Europeans criticize the United States for its materialism but such criticism is only to cover up their realization that American culture is far superior to their own.

18. The worst danger to real Americanism during the last 50 years has come from foreign ideas and agitators.

19. The scientist that really counts is the one who turns theories into practical use.

20. There is only one real standard in judging a novel or play--that is convey a message of social significance.

21. Nudist colonies are a threat to the moral life of a nation.

22. Allowing more immigrants of all kinds into this country will improve our culture.

23. No world organization should have the right to tell Americans what they can or cannot do.

24. Despite the material advantages of today, family life now is not as wholesome as it used to be.

25. Raising our standard of living requires government regulation of business enterprise.

26. The United States doesn't have to depend on the rest of the world in order to be strong and self-sufficient.

27. Foreigners usually have peculiar and annoying habits.

28. The best assurance of peace is for the United States to have the strongest army, navy, and air force, as well as the most atom bombs.

29. It is only natural and right for each person to think that his family is better than any other.

30. Any man can find a job if he really wants to work.

31. Strikes are caused by the unwillingness of an employer to meet the needs of his employees.

32. American films emphasize sex more than foreign films do.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

33. Being a successful wife and mother is more a matter of instinct than of training.

34. The only way to eliminate prejudice is through forceful legislation.

35. A person often has to get mad in order to push others into action.

36. There is only one real standard in judging art works--each to his own taste.

37. Business enterprise, free from government interference, has given us our high standard of living.

38. There is no art for art's sake.

39. The existence of poverty is an infallible sign of a poorly organized society.

40. Many social problems would be solved if we did not have so many immoral and inferior people.

41. Picket lines ought to be respected and never crossed.

42. You can't do business on friendship: profits are profits, and good intentions are not evidence in a law court.

43. A person has troubles of his own; he can't afford to worry about other people.

44. Books and movies should start dealing with entertaining or uplifting themes instead of the present unpleasant, immoral, or tragic ones.

45. The minds of many youth are being poisoned by bad books.

46. Speak softly, but carry a big stick.

47. Military service should be a choice rather than conscription.

48. Peace can only be achieved when the United States abandons its attempt to establish military superiority.

49. Honesty, hard work, and trust in God ensure neither material nor spiritual rewards.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

50. Ministers in churches should not preach about economic and political problems.

51. Each man is on his own in life and must determine his own destiny.

52. The moral good or evil of people has little bearing on any possible destruction of the world.

53. The successful merchant can't allow sentiment to affect his business decisions.

54. No intelligent man today can really believe in God.

55. The United States should make no attempt to exercise control over any world organization.

56. Ministers who preach socialistic ideas are a disgrace to the church.

57. Labor unions don't appreciate all the advantages which business and industries have given them.

58. We should impose a strong censorship on the morality of books and movies.

59. European criticism of the United States is quite justified.

60. If we allow more immigrants into this country, we will lower our standard of culture.

61. Modern paintings look like something dreamed up in a horrible nightmare.

62. The greatest contribution to real Americanism during the last fifty years has come from the intermingling of foreign immigrants and native-born.

63. What a person gets in this life has little to do with whether he believes in God or not.

64. Voting determines whether or not a country is democratic.

65. In our society, a person's first duty is to protect from harm himself and those dear to him.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

66. Europeans have no faults as bad as the provincial smugness and intolerance of Americans.

67. Members of so-called racial minorities are no more alike than any other group of American citizens.

68. A belief in divine guidance is of little help in meeting difficulties.

69. Those who can, do; those who can't, teach.

70. Philosophers on the whole act as if they were superior to ordinary people.

71. We would be better off if people would talk less and work more.

72. Most intellectuals would be lost if they had to make a living in the realistic world of business.

73. Science will eventually explain the origin of life.

74. A lot of teachers, these days, have radical ideas which need to be carefully watched.

75. Now that America is the leading country in the world, it's only natural that other countries should try to be like us.

76. Prayer does little toward relieving one's problems.

77. Capital punishment does not serve to lower the crime rate.

78. Foreign films emphasize sex more than American films do.

79. Our rising divorce rate is a sign that we should return to the values which our grandparents held.

80. Pride in craftsmanship and in doing an honest day's work is a rare thing these days.

81. The United States may not have had much experience in international dealings, but it is the only nation to which the world can turn for leadership.

82. A sexual pervert is an insult to humanity and should be punished severely.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

83. Labor, since it represents the majority, should be given a greater voice in a democracy than capital.

84. The actions of the United States in world politics clearly demonstrate its unfitness for world leadership.

85. Both beauty and purpose can be found in all modern paintings.

86. There may be a few exceptions, but, in general, members of a racial group tend to be pretty much alike.

87. There are too many people in this world who do nothing but think about the opposite sex.

88. Modern people are superficial and tend to lack the finer qualities of manhood and womanhood.

89. It is more important for a book or movie to be realistic than to be pleasant.

90. Members of religious sects who refuse to salute the flag should be punished for their lack of patriotism.

91. As young people grow up, they ought to get over their radical ideas.

92. The twentieth century has not had leaders with the vision and capacity of the founders of this country.

93. Books on tragic and sordid themes help youth to face the world of reality.

94. There are a lot of things in this world that will never be explained by science.

95. The world will get so bad that some of these times God will destroy it.

96. Other countries don't appreciate as much as they should all the help that America has given them.

97. If a person is honest, works hard, and trusts God, he will reap material as well as spiritual rewards.

98. The welfare of others is more important than one's own self-interests.

KEY: A. I strongly agree or accept the statement.
B. I tend to agree or accept the statement.
C. I tend to disagree or reject the statement.
D. I strongly disagree or reject the statement.

99. Nothing but profit to our country would result from the relaxation of our present strict immigration laws.

100. No censorship on the presumed morality of books and movies can be justified.

APPENDIX D

Appendix D contains correlation matrices and regression tables supplementary to those in the body of the report. The first correlation matrix (Table D-1) is for Year I, the remaining tables in this appendix are for subjects participating in the study during Year II.

TABLE D-1

INTERCORRELATIONS BETWEEN INQUIRY PREDICTOR VARIABLES AND INQUIRY PERFORMANCES MEASURES, YEAR I, WINTER TERM, N=30

		1	2	3	4	5	6
Competence I	1	100					
Competence II	2	49	100				
Problem Sensitivity I	3	75	33	100			
Time I	4	42	42	31	100		
Bits I	5	43	29	28	79	100	
Sources I	6	41	42	29	46	41	100
Problem Sensitivity II	7	44	62	46	32	23	28
Time II	8	03	23	-07	55	41	-17
Bits II	9	05	09	-01	23	36	-09
Sources II	10	19	51	16	33	20	-21
First and Last Names	11	24	21	01	16	16	15
Picture-Gestalt	12	34	-18	36	16	-05	00
Math Aptitude	13	53	22	41	18	31	-04
Inferences	14	-05	-28	-06	-11	-13	-30
Seeing Deficiencies	15	26	-26	34	09	05	-10
Closure Flexibility	16	03	-28	17	06	08	-12
Picture-Number	17	00	08	-05	09	26	03
Object-Number	18	-40	33	-25	17	-11	-41
Finding A's	19	20	08	25	13	13	-05
Number Comprehension	20	-02	-14	29	50	45	25
Maze Tracing	21	17	-32	19	16	09	-22
Figure Classification	22	11	-15	26	08	09	00
Concealed Words	23	-26	12	-44	-01	14	00
Word Association	24	27	-02	21	-09	-15	-07
Adv. Vocabulary	25	51	10	42	05	16	09
Assocations IV	26	11	-36	13	-10	02	-16
Impulsivity Time	27	-10	-07	-16	14	19	08
Gestalt-Completion	28	22	-12	52	-26	-33	-04
Dogmatism	29	14	10	21	-10	03	17
MSU Reading	30	-11	-15	-25	-12	-03	-01
CQT Verbal	31	00	-03	-07	-29	-16	-03
CQT Information	32	33	-01	07	-06	09	-01
CQT Numerical	33	18	-10	14	42	35	02
CQT Total	34	20	-05	05	-02	09	-01
GPA	35	02	-12	06	01	04	08
D-V Inventory	36	29	30	46	29	33	49
Syllogism-Risk	37	-16	-43	-07	-13	15	-08
Test Anxiety	38	-03	-02	14	16	00	21
Defensiveness	39	-07	-15	15	-04	05	-05
Impulsivity (Number Correct)	40	-14	-10	-20	08	07	-12
Extraversion	41	28	30	23	14	14	13
Neuroticism	42	06	-15	06	-01	12	-05
Inventory of Beliefs	43	-03	06	01	-08	-37	-18
General Inquiry I	44	89	51	85	49	46	70
General Inquiry II	45	43	84	37	42	28	36

TABLE D-1 (Cont.)

	7	8	9	10	11	12	13	14	15	16	17
1											
2											
3											
4											
5											
6											
7	100										
8	18	100									
9	39	58	100								
10	66	20	26	100							
11	09	-03	-01	-16	100						
12	-04	21	04	-35	-20	100					
13	09	16	-02	-20	46	22	100				
14	-06	-09	-18	-40	-06	18	17	100			
15	-21	06	-06	-36	-01	54	26	25	100		
16	-26	01	-15	-33	-19	20	13	36	50	100	
17	-11	30	21	-38	59	-02	48	-01	62	36	100
18	03	32	20	-19	03	08	-06	23	-20	-15	XXX
19	24	17	34	-17	46	19	51	28	65	65	51
20	-12	-20	-43	-29	36	06	17	-04	06	32	XXX
21	-20	24	12	-41	-01	60	23	21	47	39	27
22	-23	10	-24	-25	-10	28	35	17	60	63	45
23	-33	10	-05	-24	73	-55	07	-23	17	06	66
24	08	05	-11	-13	-04	46	31	12	20	43	04
25	30	-13	12	00	25	13	35	05	15	02	21
26	-20	-01	00	-30	-08	17	02	39	33	24	-16
27	16	08	01	17	-22	-06	-09	23	-15	-10	-14
28	-18	-04	04	-29	-46	74	-05	-28	48	04	XXX
29	08	-26	-29	-16	54	-31	41	04	-22	-12	32
30	06	-08	-12	00	-16	02	02	53	04	37	06
31	00	-17	-17	-32	16	06	23	39	16	41	56
32	06	-03	-05	-03	29	03	57	25	23	18	61
33	14	19	00	18	-12	-01	35	43	24	42	14
34	07	-02	-10	-11	16	04	48	45	26	43	65
35	05	-10	-25	-20	05	19	34	51	08	17	10
36	38	-19	-14	16	11	-13	08	-07	-04	08	19
37	00	-05	15	-07	-13	-04	17	34	-18	31	-01
38	-12	07	-22	-05	-16	06	-14	-24	-02	-03	-43
39	08	-10	01	-12	-13	16	11	24	39	39	28
40	-12	-16	-27	-06	-06	-18	-08	25	06	-04	-11
41	29	11	09	22	03	02	12	-10	11	-09	33
42	-08	06	04	-14	18	-01	19	-14	00	-14	16
43	16	00	-13	18	-40	28	-14	33	18	-04	-30
44	48	-09	-02	23	16	29	38	-17	21	04	-01
45	88	24	28	85	06	-22	04	-29	-32	-34	-15

TABLE D-1 (Cont.)

	18	19	20	21	22	23	24	25	26	27	28
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18	100										
19	XXX	100									
20	-08	XXX	100								
21	02	51	44	100							
22	-13	40	30	39	100						
23	XXX	23	XXX	-19	13	100					
24	-15	32	08	23	29	-37	100				
25	-25	06	-23	-14	-17	05	14	100			
26	-29	-06	-07	17	17	-12	05	06	100		
27	-21	-05	-25	-17	-16	-27	-21	05	02	100	
28	-04	XXX	-17	22	17	XXX	01	40	03	-20	100
29	-21	-12	28	-24	-01	35	-11	34	17	-08	-20
30	-31	35	-32	-35	-05	13	40	26	09	47	-05
31	-45	40	05	-08	00	66	34	44	06	04	27
32	-55	73	-33	-06	08	44	29	66	00	19	18
33	-31	21	33	15	36	-22	-03	30	-04	42	-50
34	-53	65	-02	-01	16	44	28	61	02	25	09
35	-10	34	01	03	14	-16	25	18	-08	40	-06
36	-26	49	14	-01	03	09	-10	21	02	40	-04
37	-60	07	28	07	10	-28	20	11	13	34	-30
38	20	-59	34	00	28	-23	-02	-22	19	-31	-08
39	-15	56	13	24	34	-01	00	-15	-10	33	03
40	20	-01	04	04	-05	06	-47	-10	07	58	-30
41	-14	18	05	01	01	-24	23	-11	-31	-10	-44
42	-18	-44	29	10	05	09	18	22	25	-30	-22
43	12	-17	-26	08	-08	-56	16	-10	-09	-07	-06
44	-55	16	28	06	16	-28	17	42	04	-07	34
45	06	06	-22	-36	-24	-17	-03	15	-34	10	-24

TABLE D-1 (Cont.)

	29	30	31	32	33	34	35	36	37	38	39
29	100										
30	-12	100									
31	28	66	100								
32	23	61	59	100							
33	07	32	20	42	100						
34	26	70	82	87	64	100					
35	-01	72	37	62	32	57	100				
36	38	05	09	06	14	12	12	100			
37	10	48	30	30	42	42	46	-01	100		
38	18	-50	-41	-56	-04	-47	-40	10	-30	100	
39	-29	26	11	-07	17	09	35	15	33	-33	100
40	-06	-02	-22	-17	30	-07	03	33	-12	-03	35
41	-10	-12	-07	04	04	-01	02	-06	-08	-10	05
42	35	-32	01	-09	03	-02	-30	00	02	55	-51
43	-42	22	06	02	13	08	19	-37	-12	-08	14
44	22	-16	-04	16	14	10	07	50	-13	14	02
45	01	-04	-14	01	08	-04	-11	32	-21	-07	-08

	40	41	42	43	44	45
40	100					
41	-29	100				
42	-19	-02	100			
43	-02	30	-20	100		
44	-19	26	03	-08	100	
45	-11	32	-14	15	48	100

TABLE D-2

INTERCORRELATIONS BETWEEN INQUIRY PREDICTOR VARIABLES AND INQUIRY PERFORMANCE MEASURES, YEAR II, N=56

		1	2	3	4	5	6	7	8	9	10
Complexity	1	100									
Lecture-Discussion	2	60	100								
Beliefs	3	50	43	100							
GPA	4	-25	-23	08	100						
Word Associations	5	29	12	36	38	100					
Closure Flexibility	6	21	18	07	29	44	100				
Syllogism-Risk	7	14	30	05	-09	13	-02	100			
Test Anxiety	8	17	13	-42	-06	-21	-14	-13	100		
Defensiveness	9	-14	-13	-11	-01	14	07	-04	-26	100	
Politics	10	23	06	36	16	39	07	01	-05	-16	100
Focus-Scan	11	23	26	19	13	36	21	01	-26	26	02
Education Scale	12	-32	-27	-22	-10	-10	-01	-38	04	20	05
Social Class	13	-06	-02	08	-09	02	15	13	15	11	-04
Rorschach Total Responses	14	-16	-26	04	-05	00	-18	08	-21	04	-07
Rorschach F+%	15	25	10	07	14	22	20	-10	21	11	02
Rorschach Z	16	03	-04	05	11	19	-01	-32	-15	01	02
Rorschach Time to 1st Resp.	17	01	15	-27	-09	-13	-01	13	10	-13	00
Rorschach W%	18	03	17	14	13	08	09	-35	-18	00	08
Rorschach D%	19	06	-15	-01	-10	05	03	35	20	-02	02
Rorschach Dd%	20	-25	-05	-36	-06	-36	-35	-01	-05	05	-28
Reflection-Impulsivity Time	21	08	-10	07	01	-08	-11	04	-07	09	-09
Reflection-Impulsivity Errors	22	-15	04	-10	-06	-30	-07	-21	-02	-02	04
WAIS Block Design	23	09	16	04	14	25	60	-10	03	-05	-05
Stroop	24	03	09	-02	00	-20	-08	-10	-02	12	12
MSU English	25	-02	03	15	48	38	22	27	-39	15	11
MSU Reading	26	06	06	22	54	42	22	15	-35	-08	19
CQT Verbal	27	12	07	31	41	42	23	19	-25	-07	11
CQT Information	28	-09	00	04	41	29	24	26	-28	-14	-03
CQT Numerical	29	-17	-04	-08	39	32	36	28	-19	08	11
CQT Total	30	-06	00	14	52	45	36	30	-31	-05	09
General Inquiry I	31	13	-03	12	02	16	05	16	-06	-16	-04
General Inquiry II	32	25	08	31	19	39	24	26	-27	-03	36
Competence I	33	04	-14	10	02	-02	-04	01	-03	-17	-02
Competence II	34	13	07	22	14	28	06	32	-11	-06	46
Problem Sensitivity I	35	18	01	21	08	28	12	16	-16	00	-01
Problem Sensitivity II	36	27	12	37	22	39	24	21	-32	02	33
Shifts I	37	15	00	19	-03	19	07	13	12	-25	17
Shifts II	38	11	-06	-04	06	16	07	16	-13	07	26
Corrected Shifts I	39	19	03	20	-01	20	04	14	10	-28	19
Corrected Shifts II	40	16	-02	06	-04	14	00	06	-07	07	23
Time I	41	40	23	40	-31	28	-06	05	17	-02	15
Time II	42	47	09	42	-02	27	05	14	-07	02	35
Shift Ratio I	43	-08	-13	-02	18	06	17	11	02	-27	14
Shift Ratio II	44	-14	-11	-28	02	08	04	13	-08	09	12
Corrected Shift Ratio I	45	-03	-08	01	20	08	17	11	-02	-31	15
Corrected Shift Ratio II	46	-08	-05	-14	-06	09	00	03	-06	04	10
Bits I	47	18	07	19	-13	13	03	-01	20	-32	11
Bits II	48	18	11	35	19	39	24	8	-22	19	19
Sources I	49	07	-01	02	-03	15	06	21	-04	-22	-03
Sources II	50	24	03	20	14	33	27	22	-29	00	15
Inquiry Bits I	51	13	02	24	-02	24	15	10	-05	-11	16
Inquiry Bits II	52	31	06	12	-03	24	13	14	-09	05	22
Inquiry Sequences I	53	00	-01	06	-15	22	26	10	11	-22	-01
Inquiry Sequences II	54	11	03	-05	02	13	12	16	-10	-13	05
Inquiry Ratio I	55	11	01	17	01	13	15	03	-13	00	01
Inquiry Ratio II	56	10	-15	-12	-09	09	-01	-03	-13	00	06
Average Sequence Length I	57	17	02	25	15	-03	-14	-05	-16	09	27
Average Sequence Length II	58	29	-04	24	01	26	07	-07	-04	19	31
Scaled Reflection	59	-15	-14	-18	-15	-21	-17	-16	-02	26	-03
Dialectical-Didactic	60	73	71	66	02	62	49	43	-02	-08	29

TABLE D-2 (Cont.)

	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11	100														
12	-22	100													
13	06	16	100												
14	14	-06	01	100											
15	09	07	13	-20	100										
16	21	29	-13	29	-08	100									
17	-35	00	-14	-67	00	-31	100								
18	17	27	-26	-13	-09	59	-11	100							
19	-17	-28	29	13	14	-54	08	-94	100						
20	00	04	-08	-01	-13	-14	08	-19	-16	100					
21	03	13	09	-16	03	02	02	02	-02	02	100				
22	-20	03	-16	01	04	-21	00	18	-25	21	-54	100			
23	19	03	09	-16	22	-02	-07	14	-06	-22	-05	01	100		
24	-20	07	-05	-05	06	-07	-04	02	-06	11	-21	27	-10	100	
25	11	-14	-18	22	-08	19	-09	-01	06	-15	11	-42	01	-18	100
26	31	-24	-18	03	19	11	-28	17	-13	-11	10	-20	17	-13	53
27	19	-29	-07	-01	22	00	-20	00	14	-38	01	-24	19	-04	46
28	-03	-14	02	17	-06	10	-11	07	-01	-18	-08	-17	14	-08	50
29	05	-08	-07	19	-06	-06	-03	-07	12	-16	-13	-07	23	-26	47
30	09	-22	-05	14	08	01	-15	-02	14	-34	-10	-20	26	-16	60
31	12	-24	05	01	-04	03	00	10	-05	-15	-03	-19	13	-17	-12
32	26	-15	14	23	03	-01	-19	-10	18	-23	00	-24	06	00	22
33	06	-18	08	-05	-24	-05	03	13	-12	-03	04	-15	16	-12	-18
34	16	-10	10	21	-19	-06	-15	-12	15	-08	-12	-19	-10	07	30
35	20	-16	11	05	07	07	-13	09	00	-26	00	-20	11	-19	-03
36	24	-15	05	23	14	03	-15	-07	17	-31	00	-23	08	05	26
37	02	-11	10	-03	-10	-13	01	-03	12	-26	-12	-09	05	-13	-22
38	-01	-08	02	-03	04	-11	20	-25	32	-21	-03	-06	-13	-10	-05
39	05	-14	06	00	-06	-08	00	01	07	-24	-10	-08	04	-09	-20
40	12	-10	04	08	03	-02	01	-18	25	-20	-03	-07	-15	-06	-10
41	24	04	07	-03	11	18	-15	19	-10	-25	07	-17	08	-18	-18
42	10	-10	-07	14	09	13	-23	-07	16	-26	17	-22	-09	-02	01
43	-11	-14	09	-03	-20	-28	10	-18	21	-11	-20	04	04	-03	-10
44	-10	01	10	-08	-05	-15	32	-21	24	-09	-16	06	-10	-07	-06
45	-05	-17	05	01	-15	-20	08	-11	14	-10	-21	05	05	01	-09
46	09	-08	10	02	-03	-09	16	-13	17	-13	-18	06	-07	-03	-15
47	02	-06	05	-07	04	05	03	06	01	-20	-08	-16	15	-11	-14
48	16	-18	27	08	25	-07	-10	-21	33	-35	-02	-03	09	-03	08
49	-01	-23	-06	02	04	01	11	01	02	-10	-10	-11	07	-11	-10
50	22	-14	23	15	06	-04	-16	-11	17	-17	15	-21	-09	-11	12
51	01	-05	01	-01	03	-09	-07	09	01	-26	-12	10	11	-16	-20
52	03	-21	04	-04	16	-02	12	-10	21	-29	04	-03	-03	-12	-12
53	-08	03	18	-08	05	-16	04	-06	16	-28	-13	-04	09	-21	-20
54	-16	-14	01	-24	12	-15	40	-16	23	-21	-02	07	-05	-18	-17
55	-07	-03	-02	-08	03	-20	-01	09	-05	-13	-08	30	15	-14	-27
56	-01	-07	-14	09	-11	10	06	-04	03	03	07	-10	-16	-21	-06
57	07	-04	-28	09	-03	04	-19	26	-27	01	00	31	13	09	-04
58	16	-07	-02	27	05	21	-33	10	-04	-16	11	-14	07	04	16
59	-21	21	-02	-01	10	-25	03	-02	-06	24	-10	67	-05	14	-23
60	35	-36	10	-11	15	-04	-04	-01	13	-35	-08	-21	27	-07	20

TABLE D-2 (Cont.)

	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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26	100														
27	68	100													
28	49	57	100												
29	31	15	42	100											
30	65	79	83	66	100										
31	30	27	18	-02	19	100									
32	30	24	11	03	17	37	100								
33	14	07	07	-09	02	83	31	100							
34	31	18	17	11	19	26	80	30	100						
35	37	39	19	-01	26	88	41	60	19	100					
36	27	26	09	05	19	31	94	21	63	42	100				
37	19	25	12	00	17	75	41	61	38	69	30	100			
38	-01	-02	-19	-03	-09	31	56	19	38	34	54	40	100		
39	22	24	13	-02	16	76	40	61	35	68	31	97	41	100	
40	-03	-01	-26	-14	-16	37	60	26	37	43	58	48	92	50	100
41	07	17	-03	-16	01	41	25	25	19	46	25	50	12	51	29
42	12	11	-07	-09	-01	21	69	17	52	25	69	32	50	34	58
43	18	14	12	11	17	58	36	55	39	46	22	82	42	78	40
44	-12	-11	-12	00	-10	24	26	14	20	24	20	26	82	24	68
45	21	13	13	08	15	61	37	57	36	47	24	80	43	82	44
46	-15	-07	-24	-14	-18	34	33	23	17	33	29	38	77	40	82
47	12	16	10	-06	08	52	21	38	21	45	13	64	14	61	22
48	08	25	09	10	20	09	47	-10	22	21	49	20	56	20	52
49	26	26	23	03	23	85	20	54	12	68	15	64	22	68	24
50	24	19	05	-06	08	39	87	28	55	46	78	37	59	36	59
51	32	32	00	-02	17	73	37	55	32	71	30	95	37	92	46
52	06	08	-14	-23	-11	45	62	27	35	48	60	53	93	57	93
53	24	27	02	-05	13	54	29	34	30	54	18	80	30	72	34
54	02	-04	-11	-18	-13	19	34	09	14	18	31	29	81	29	66
55	20	21	-05	-04	10	57	20	47	08	57	17	71	31	71	37
56	00	-04	-13	-25	-17	42	47	30	28	40	44	39	56	42	62
57	08	03	-05	06	02	23	09	30	05	17	12	27	04	35	15
58	09	18	01	-05	07	48	50	38	36	48	50	45	32	51	49
59	-26	-27	-25	-15	-28	-32	-25	-24	-20	-27	-24	-24	-05	-25	-09
60	25	32	17	19	29	17	42	01	31	26	43	22	13	24	13

TABLE D-2 (Cont.)

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
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41	100														
42	43	100													
43	-05	12	100												
44	-08	-02	39	100											
45	-02	15	97	38	100										
46	12	08	40	87	45	100									
47	46	13	41	09	38	19	100								
48	18	36	13	44	13	44	25	100							
49	35	07	48	23	53	29	47	12	100						
50	15	56	37	38	37	40	17	54	22	100					
51	57	36	77	18	77	31	58	21	62	33	100				
52	40	63	42	67	48	73	34	60	35	67	53	100			
53	40	12	72	28	65	35	57	19	50	32	81	40	100		
54	03	31	39	72	41	61	24	51	19	49	27	78	35	100	
55	40	27	62	16	64	27	10	07	45	28	84	44	60	21	100
56	35	50	28	37	33	44	09	00	35	49	41	68	25	43	43
57	29	38	13	-21	22	-09	03	-04	13	03	34	14	-24	-13	43
58	55	58	17	05	24	24	20	18	38	38	45	46	13	-16	42
59	-06	-24	-21	11	-23	05	-17	04	-27	-18	-04	03	-11	11	16
60	35	39	06	-06	09	-02	18	42	16	35	23	25	16	13	16

TABLE D-2 (Cont.)

	56	57	58	59	60
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56	100				
57	23	100			
58	51	46	100		
59	00	18	-08	100	
60	-04	06	19	-31	100

TABLE D-3

CORRELATIONS OF 18 SELECTED PREDICTOR VARIABLES WITH INQUIRY CRITERION VARIABLES FOR FIRST AND SECOND ADMINISTRATIONS (N=56), YEAR TWO[a]

Inquiry Variable	Competence		Problems		Sources		Time		Bits		General Inquiry	
Administration	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Complexity	01	20	17	27	06	24	41	43	19	18	09	26
Lect-Disc.	-19	12	01	11	-01	03	26	06	07	12	-07	10
Beliefs	06	31	20	36	00	21	43	38	20	35	10	33
GPA	05	14	09	21	02	15	-32	05	-14	19	05	18
Word Ass'n.	08	33	25	33	21	31	24	32	17	36	21	36
Closure Flex.	-05	12	13	22	07	26	-05	14	02	24	06	22
Syllogism-Risk	01	28	14	26	20	23	04	23	00	27	14	28
Test Anxiety	-05	-16	-15	-32	-04	-30	14	-11	19	-21	-09	-29
Defensiveness	-17	-11	-01	06	-23	01	-02	04	-30	18	-16	-02
Politics	-02	45	01	32	-02	15	18	40	11	21	-01	34
Ave. Time	03	-15	00	02	10	15	07	07	-07	-03	-03	01
Total Errors	-13	-21	-19	-24	-11	-21	-13	-23	-16	-02	-17	-25
Block Design	14	00	11	03	07	08	12	-10	14	09	12	05
Stroop	-12	06	-18	04	-10	-11	-22	-02	-11	-03	-16	00
Reading	15	29	36	29	27	25	04	17	12	08	30	31
CQT Num.	-05	10	00	05	04	-07	-20	-02	-07	10	00	03
CQT Total	03	18	26	19	24	08	-04	08	08	20	21	17
Rorschach Dd%	-03	-08	-26	-31	-10	-17	-25	-26	-20	-35	-15	-23

[a] For N=56, the probability of a correlation of .27 occurring by chance is $\leq .05$; the probability of a correlation of .31 is $\leq .01$. (two-tailed tests)

TABLES D-4 AND D-5

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF COMPETENCE AND GENERAL INQUIRY, ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=56) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table D-4 - Competence

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Lecture-Discussion†	19	04	Politics	45	20
Defensiveness†	28	08	Total Errors†	50	25
Block Design	32	10	Average Time†	57	33
Beliefs	36	13	Syllogism-Risk	61	37
+13 Other Variables	49	24	Reading	63	40
			CQT Total†	65	42
			Beliefs	66	44
			+10 Other Variables	69	47

Table D-5 - General Inquiry

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	30	09	Politics	34	12
Word Association	33	11	Test Anxiety†	44	19
GPA†	37	14	Total Errors†	51	26
Lecture-Discussion†	41	17	Syllogism-Risk	55	30
Defensiveness†	44	20	Closure-Flexibility	57	32
CQT Number†	45	21	CQT Total†	58	34
+11 Other Variables	52	27	Reading	60	36
			Average Time†	62	39
			+9 Other Variables	68	46

† indicates negative regression weight

TABLES D-6 AND D-7

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF PROBLEM SENSITIVITY AND INFORMATION SOURCES ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=56) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table D-6 - Problem Sensitivity

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	37	13	Beliefs	36	13
Word Association	41	16	Test Anxiety†	47	22
CQT Numerical†	44	19	Total Errors†	51	26
Stroop†	44	21	Politics	56	31
Syllogism-Risk	48	23	Syllogism-Risk	58	33
+12 Other Variables	55	30	Closure Flexibility	60	35
			Average Time†	60	36
			CQT Total†	62	38
			+9 Other Variables	66	43

Table D-7 - Information Sources

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Reading	27	07	Word Association	31	10
Defensiveness†	34	11	Test Anxiety†	42	18
GPA†	39	15	CQT Number†	48	23
Word Association	43	19	Syllogism-Risk	52	27
Lecture-Discussion†	46	21	Closure-Flexibility	57	33
+12 Other Variables	53	28	Lecture-Discussion†	59	35
			Complexity	61	37
			Reading	62	39
			+9 Other Variables	65	42

† indicates negative regression weight

TABLES D-8 AND D-9

STEP-WISE MULTIPLE REGRESSION ANALYSES FOR PREDICTION OF TIME AND BITS, ADMINISTRATIONS ONE AND TWO, USING 17 PREDICTOR VARIABLES (N=56) WITH VARIABLES LISTED IN THE ORDER IN WHICH THEY WERE ADDED

Table D-8 - Time

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Beliefs	44	19	Complexity	44	19
GPA†	56	31	Politics	53	28
Stroop†	60	36	Lecture-Discussion†	58	33
Word	62	38	Total Bet	63	40
CQT Number†	63	40	Beliefs	65	43
CQT Total	65	42	Defensiveness	67	44
+11 Other Variables	70	49	+11 Other Variables	70	49

Table D-9 - Bits

Administration 1			Administration 2		
Variable	R	R^2	Variable	R	R^2
Defensiveness†	30	09	Word Association	36	13
GPA†	33	11	Beliefs	44	19
Reading	39	16	Syllogism-Risk	49	24
Total Error†	42	18	Defensiveness	54	29
Average Time†	45	21	GPA	55	31
+12 Other Variables	52	27	Reading†	57	33
			Closure Flexibility	59	34
			CQT Number†	60	36
			+9 Other Variables	63	40

† indicates negative regression weight

APPENDIX E

Appendix E contains the complete raw data for all subjects participating in the second year of the study. Below is a listing of the tables in this appendix, their names, and explanations of the scores when necessary.

Table E-1	Basic Inquiry Performance Scores, Administration I
Table E-2	Basic Inquiry Performance Scores, Administration II

In tables E-1 and E-2 the columns labeled *In-basket* refer to the in-basket form to which the scores correspond; 1=A, 2=B.

Writing refers to the number of times the subject wrote down information during the in-basket.

Externals is the number of times the subject called out to the secretary or reference memory for additional information. Notice that there are two sources scores, Mean sources and Total sources. Total sources was the total number of information sources used in inquiry. Mean sources was the average number of sources used per problem category into which the subject inquired.

Table E-3 Shifting and Competence Scores, Administration I and II

The scores for the five subjects who failed to return for the second Administration are not included in this, or subsequent tables.

All ratio scores in this and subsequent tables (including GPA) should be read as having two places to the right of the decimal (eg., 2.01 or .98) although in most cases it was not inserted.

Table E-4 Problem Solving Scores, Administration I and II

Table E-5 Scores on Group and Individually Administered Predictor Tests

Classification refers to the seeking style X GPA classification used in the ANOVA's. 1 = Dialectical, High GPA; 2 = Dialectical, Low GPA; 3 = Didactic, High GPA; 4 = Didactic, Low GPA; 5 = Pattern, High GPA; 6 = Pattern, Low GPA.

Total Bet refers to the amount of $ 1.80 bet on the Syllogism-Risk Scale.

Closure-Flexibility Total was the total number of items tried on the *Closure-Flexibility Scale* and was not used in the analysis.

Of the six scores given for the *Stroop Color-Word Test*, only difference C was interpreted in the body of the report. Scores I, II, and III are time scores; the time taken to read (I) names of colors printed black on white, (II) nonsense words printed in different colors and (III) the names of colors printed in different colors, eg., the word *red* printed in green ink etc. The differences are interpreted thusly; differences A = I-II, B = I-II and C = II-III. Difference C is considered a measure of interference.

The *Average Time* score for *Reflection-Impulsivity* should be read as having one place to the right of the decimal, eg., 48.1 or 54.3.

TABLE E-1
IN-BASKET VARIABLES, ADMINISTRATION I

Student Number	In-Basket	General Inquiry	Problem Sensitivity	Writing	Externals	Time	Bits	Mean Sources	Total Sources
1	2	158	75	45	6	140	288	59	59
2	2	174	73	23	9	120	225	73	66
3	2	104	64	11	0	125	267	49	44
4	2	125	50	30	0	122	162	53	48
5	2	153	59	44	5	114	169	52	47
6	2	172	106	6	5	137	208	59	59
7	2	124	71	13	3	133	301	63	57
8	2	207	76	24	7	114	159	50	45
9	2	116	33	21	18	71	161	36	36
10	2	114	62	33	13	135	221	54	49
11	2	150	72	34	5	141	293	59	59
12	2	182	116	28	10	143	219	75	75
13	2	136	74	19	3	133	297	65	53
14	2	146	55	7	5	114	256	51	46
15	2	133	44	27	3	109	198	57	51
16	2	145	62	41	7	155	212	58	58
17	2	132	42	16	10	117	116	44	44
18	2	240	75	26	9	127	226	50	45
19	2	147	82	43	2	129	258	72	72
20	2	134	67	21	1	101	175	55	55
21	2	134	64	15	8	123	241	66	59
22	2	139	74	39	4	65	152	60	60
23	2	130	64	21	7	115	166	49	44
24	2	122	54	14	2	83	167	44	44
25	2	137	58	54	16	152	173	78	62
26	2	139	54	37	3	107	225	55	55
27	2	192	70	33	10	138	220	73	51
28	2	146	56	38	3	113	175	52	52

TABLE E-1 (Cont.)

Student Number	In-Basket	General Inquiry	Problem Sensitivity	Writing	Externals	Time	Bits	Mean Sources	Total Sources
29	1	160	65	36	13	110	237	56	56
30	1	181	71	30	8	135	322	75	75
31	1	133	61	30	1	126	222	50	45
32	1	147	63	7	9	153	205	52	42
33	1	126	53	6	12	78	206	46	46
34	1	146	53	8	16	100	189	57	57
35	1	160	65	29	28	141	222	63	63
36	1	165	84	30	7	155	210	66	59
37	1	168	84	15	26	153	302	63	63
38	1	139	64	17	14	122	210	50	50
39	1	144	62	8	2	168	220	68	55
40	1	129	40	15	14	130	158	53	43
41	1	187	81	55	18	118	330	70	70
42	1	157	64	27	20	157	234	60	60
43	1	167	74	16	16	125	169	52	52
44	1	161	72	25	9	101	168	65	65
45	1	205	97	23	18	165	322	68	68
46	1	131	49	23	20	66	147	51	51
47	1	139	76	14	7	148	161	54	38
48	1	150	49	12	9	97	147	47	47
49	1	116	39	11	4	93	130	40	36
50	1	146	68	29	6	133	243	42	38
51	1	171	77	45	11	116	147	63	63
52	1	119	42	12	7	94	162	41	41
53	1	105	34	43	8	95	119	35	27
54	1	174	74	33	12	123	321	57	57
55	1	149	49	26	22	150	314	51	51
56	1	187	72	12	12	86	204	63	63
57	2		84	44	6	118	266	79	79
58	2		102	78	6	122	254	53	48
59	2		64	17	5	104	228	68	61
60	1		76	26	10	176	264	51	51
61	1		49	29	3	131	216	42	42

TABLE E-2

IN-BASKET VARIABLES, ADMINISTRATION II

Student Number	In-Basket	General Inquiry	Problem Sensitivity	Writing	Externals	Time	Bits	Mean Sources	Total Sources
1	1	178	68	38	9	84	161	66	59
2	1	164	80	18	2	103	287	68	68
3	1	133	38	9	6	67	85	44	34
4	1	128	49	36	4	88	134	40	40
5	1	132	61	34	6	85	241	60	60
6	1	188	86	30	14	132	159	72	72
7	1	150	55	8	2	77	211	42	38
8	1	148	98	28	13	151	203	75	75
9	1	100	42	21	9	65	112	43	39
10	1	145	43	10	8	66	87	35	28
11	1	151	58	20	10	114	404	63	57
12	1	201	94	12	8	122	191	68	68
13	1	150	49	10	2	74	156	46	46
14	1	131	58	8	10	87	191	50	50
15	1	121	47	23	9	117	139	40	40
16	1	155	57	11	14	113	110	66	40
17	1	118	58	17	15	75	107	57	40
18	1	150	131	30	28	160	233	92	92
19	1	197	52	21	4	88	143	54	54
20	1	150	59	20	5	102	147	50	50
21	1	155	60	16	6	103	177	52	52
22	1	160	64	42	1	71	119	49	49
23	1	128	60	39	9	90	127	49	44
24	1	125	41	10	3	64	140	51	51
25	1	150	59	36	9	150	141	70	35
26	1	136	53	19	3	102	104	56	56
27	1	156	87	30	20	125	230	77	69
28	1	166	77	22	11	113	153	56	56

TABLE E-2 (Cont.)

Student Number	In-Basket	General Inquiry	Problem Sensitivity	Writing	Externals	Time	Bits	Mean Sources	Total Sources
29	2	137	66	15	14	94	159	48	44
30	2	116	39	15	5	92	131	46	46
31	2	191	98	24	9	154	187	64	64
32	2	207	95	6	27	141	202	67	67
33	2	157	83	16	7	92	304	61	55
34	2	191	104	36	13	148	263	64	64
35	2	173	81	19	49	149	145	54	54
36	2	144	72	14	5	103	165	50	45
37	2	158	79	7	21	142	236	46	46
38	2	124	44	4	10	82	130	45	45
39	2	144	71	13	2	94	167	44	44
40	2	122	42	35	7	98	203	53	53
41	2	187	77	22	13	99	148	63	63
42	2	179	87	35	16	121	125	65	58
43	2	133	61	17	0	88	193	50	50
44	2	136	55	22	1	74	242	61	55
45	2	138	55	6	13	80	129	53	53
46	2	128	49	17	17	81	101	53	48
47	2	141	72	18	20	147	229	57	57
48	2	143	60	13	12	94	120	58	58
49	2	100	38	10	5	78	73	32	32
50	2	174	90	27	5	147	234	60	60
51	2	152	74	13	3	107	140	55	55
52	2	140	69	2	2	81	148	39	39
53	2	99	37	26	11	71	106	37	37
54	2	173	84	15	13	138	182	56	52
55	2	176	84	23	7	150	233	55	55
56	2	171	76	14	10	118	134	54	54
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58									
59									
60									
61									

TABLE E-3

DERIVED IN-BASKET SCORES, ADMINISTRATIONS I AND II

Student Number	In-Basket Form Taken First	Shifts		Corrected Shifts		Shift-Ratio		Corrected Shift-Ratio		Competence	
		Admin. 1	Admin. 2	Admin. 1	Admin. 2	Admin. 1	Admin. 2	Admin. 1	Admin. 2	Admin. 1	Admin. 2
1	2	130	170	120	154	1.15	1.70	106	154	69	109
2	2	101	97	98	91	.70	1.21	68	114	78	93
3	2	67	42	53	59	.54	.56	42	52	13	57
4	2	44	50	44	50	.36	.59	36	59	45	52
5	2	100	89	96	89	.93	1.05	89	105	60	51
6	2	118	153	114	153	.84	1.17	81	117	52	91
7	2	115	81	103	69	.84	1.04	76	88	37	53
8	2	133	178	119	165	1.17	1.19	104	110	133	74
9	2	46	43	46	43	.65	.57	65	57	32	40
10	2	94	31	66	25	.72	.48	51	38	51	76
11	2	130	192	126	177	.96	1.61	93	148	67	46
12	2	155	108	147	108	1.08	.89	103	89	77	101
13	2	110	61	106	61	.86	.80	82	80	65	56
14	2	98	85	98	85	.88	.92	83	92	70	57
15	2	82	61	82	61	.75	.51	69	51	72	34
16	2	113	72	101	72	.73	.63	65	63	64	74
17	2	52	85	52	80	.44	1.13	44	107	53	50
18	2	113	139	113	139	.84	.87	84	87	134	56
19	2	122	74	120	74	.95	.84	93	84	78	109
20	2	117	66	105	66	1.11	.65	104	65	29	63
21	2	121	82	121	70	1.00	.87	100	80	25	67
22	2	33	76	33	38	.55	.99	55	49	43	61
23	2	52	44	52	44	.46	.50	46	50	34	45
24	2	82	93	58	36	1.01	1.45	72	56	24	51
25	2	128	101	124	101	.80	.66	78	66	79	54
26	2	73	50	73	50	.65	.45	65	45	44	46
27	2	95	83	95	83	.70	.64	70	64	117	87
28	2	66	74	66	74	.60	.63	60	63	85	80

TABLE E-3 (Cont.)

Student Number	In-Basket Form Taken First	Shifts Admin. 1	Shifts Admin. 2	Corrected Shifts Admin. 1	Corrected Shifts Admin. 2	Shift-Ratio Admin. 1	Shift-Ratio Admin. 2	Corrected Shift-Ratio Admin. 1	Corrected Shift-Ratio Admin. 2	Competence Admin. 1	Competence Admin. 2
29	1	99	96	81	88	86	101	70	93	87	64
30	1	144	62	144	62	106	67	106	67	99	41
31	1	57	91	47	87	46	58	38	55	37	97
32	1	91	102	79	99	71	111	72	104	83	132
33	1	44	40	36	38	59	43	48	41	27	57
34	1	100	206	94	113	111	147	104	81	65	89
35	1	127	103	127	103	92	62	92	62	71	105
36	1	116	79	116	79	73	72	73	72	63	72
37	1	140	97	140	93	91	75	91	72	63	93
38	1	107	30	100	30	86	35	81	35	40	60
39	1	78	58	78	58	46	61	46	61	45	74
40	1	70	77	69	76	53	57	52	56	62	32
41	1	173	48	143	48	145	48	120	48	108	118
42	1	110	42	104	42	76	35	72	35	69	100
43	1	126	52	126	52	102	57	102	57	101	45
44	1	70	89	70	74	68	119	68	99	55	45
45	1	156	59	148	59	95	56	90	56	142	55
46	1	66	58	66	58	100	69	100	69	35	55
47	1	72	115	63	103	49	79	43	71	47	29
48	1	65	55	65	55	66	58	66	58	105	78
49	1	29	30	29	30	31	38	31	38	46	47
50	1	123	77	97	77	101	51	80	51	75	77
51	1	76	70	76	70	65	64	65	64	86	58
52	1	60	38	60	38	63	42	63	42	36	82
53	1	32	33	32	33	34	40	34	40	42	27
54	1	126	102	126	102	104	68	104	68	115	107
55	1	81	66	81	66	54	46	54	46	92	105
56	1	142	111	142	111	165	116	165	116	142	105
57											
58											
59											
60											
61											

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TABLE E-4

Student Number	In-Basket Form Taken First	Problem-Solving Bits Admin. 1	Problem-Solving Bits Admin. 2	Problem-Solving Sequence Admin. 1	Problem-Solving Sequence Admin. 2	Problem-Solving Ratio Admin. 1	Problem-Solving Ratio Admin. 2	L-Bar Admin. 1	L-Bar Admin. 2
1	2	107	139	39	48	48	48	274	290
2	2	62	73	23	23	23	25	270	317
3	2	43	28	10	13	16	33	430	215
4	2	44	34	16	12	27	25	275	283
5	2	67	75	24	23	40	31	279	326
6	2	101	126	21	23	49	79	481	548
7	2	92	62	33	21	34	29	279	295
8									
9	2	27	40	7	17	18	36	386	235
10	2	90	23	27	8	41	26	333	288
11	2	114	166	33	44	39	41	345	377
12	2	141	103	37	15	64	54	381	687
13	2	82	50	26	14	28	32	315	357
14	2	62	73	19	15	24	38	326	487
15	2	61	42	10	12	31	30	610	350
16	2	77	68	25	14	36	61	308	486
17	2	37	70	11	19	32	65	336	368
18	2	90	126	27	21	40	54	333	600
19	2	109	67	29	16	53	47	376	419
20	2	109	59	37	20	62	40	295	300
21	2	84	68	27	32	35	38	311	213
22	2	7	35	3	17	5	29	233	206
23									
24	2	58	53	27	25	35	38	215	212
25	2								
26	2	61	60	30	29	27	58	203	207
27									
28									

TABLE E-4 (Cont.)

Student Number	In-Basket Form Taken First	Problem-Solving Bits Admin. 1	Problem-Solving Bits Admin. 2	Problem-Solving Sequence Admin. 1	Problem-Solving Sequence Admin. 2	Problem-Solving Ratio Admin. 1	Problem-Solving Ratio Admin. 2	L-Bar Admin. 1	L-Bar Admin. 2
29									
30									
31	1	51	91	22	26	23	49	232	350
32	1	60	90	25	26	29	44	240	346
33	1	18	27	9	11	9	9	200	245
34	1	74	142	20	52	39	54	370	273
35	1	114	99	19	13	51	68	600	762
36	1	98	74	25	16	47	45	392	463
37	1	131	112	32	23	43	47	409	487
38	1	103	18	43	9	49	14	240	200
39									
40	1	59	62	13	15	37	30	454	413
41	1	139	61	47	19	42	41	296	321
42	1	92	47	16	15	39	38	575	313
43	1	117	55	17	14	69	28	688	393
44	1	48	65	15	23	29	27	320	283
45									
46	1	66	52	17	18	43	51	388	289
47	1	83	112	19	35	52	49	437	320
48	1	50	45	12	17	34	38	417	265
49	1	14	12	6	6	11	16	233	200
50									
51	1	57	61	13	10	39	44	438	610
52	1	28	24	8	9	17	16	350	267
53	1	22	24	9	11	18	23	244	218
54	1	111	81	25	28	35	45	444	289
55	1	55	66	12	11	18	28	458	600
56									
57									
58									
59									
60									
61									

TABLE E-5
TEST BATTERY

Student Number	Classi-fication	In-Basket Form Taken First	Complexity	Lecture Discussion	Beliefs	G.P.A.	Word Association	Closure Flexibility
1	4	2	7	2	45	220	43	56
2	3	2	7	0	50	310	55	56
3	4	2	8	2	54	205	39	56
4	4	2	10	3	58	219	50	65
5	3	2	6	2	60	300	62	56
6	4	2	11	1	56	247	44	59
7	1	2	12	6	61	278	54	90
8	5	2	14	2	62	325		53
9	3	2	8	1	49	367	50	75
10	4	2	10	2	60	212	48	68
11	2	2	13	4	61	230	44	78
12	1	2	13	2	71	250	53	79
13	3	2	7	1	68	330	60	51
14	4	2	14	1	58	220	47	60
15	4	2	12	2	47	210	43	59
16	4	2	7	0	43	215		74
17	4	2	7	4	51	204	44	54
18	2	2	22	6	61	200	51	73
19	1	2	17	5	53	265	50	71
20	3	2	9	0	60	279	42	72
21	2	2	17	4	62	215	58	58
22	3	2	8	1	41	309	51	81
23	5	2	11	2	54	310		72
24	3	2	5	1	46	271	45	45
25	6	2	16	5	67	220		43
26	4	2	7	2	56	210	43	83
27	5	2	10	2	58	265	60	69
28	5	2	16	3	67	220	46	54

TABLE E-5 (Cont.)

Student Number	Classi-fication	In-Basket Form Taken First	Complexity	Lecture Discussion	Beliefs	G.P.A.	Word Association	Closure Flexibility
29	4	1	7	1	57	210	50	54
30	6	1	27	3	61	200	52	63
31	2	1	24	4	75	243	56	70
32	2	1	20	5	68	225	65	110
33	1	1	11	4	71	360	59	102
34	1	1	14	2	57	350	56	106
35	1	1	21	2	62	294	66	80
36	1	1	13	4	75	315	69	71
37	1	1	13	3	64	250	57	51
38	2	1	13	3	53	240	54	118
39	6	1	16	4	70	230	44	55
40	4	1	8	1	62	218	42	39
41	1	1	9	3	62	318	57	97
42	2	1	15	6	73	250		51
43	1	1	14	4	73	318	47	87
44	2	1	16	5	65	206	57	62
45	6	1	18	4	59	215	39	40
46	3	1	9	5	53	260	36	52
47	1	1	23	4	68	323	65	90
48	3	1	6	0	65	288	45	32
49	4	1	11	3	46	236	36	26
50	6	1	14	2	71	214	47	62
51	3	1	5	1	50	363	54	84
52	3	1	11	4	68	320	43	54
53	2	1	18	5	63	210	48	81
54	3	1	7	1	65	310	52	29
55	1	1	20	4	79	290		78
56	5	1	8	2	57	319	47	100
57		2	17	0	61	339	52	84
58		2	17	1	60	224	52	88
59		2	17	3	68	210	62	64
60		1	8	1	55	292	59	64
61		1	13	4	64	220		79

TABLE E-5 (Cont.)

Student Number	Total Bet	Test Anxiety	Defensive-ness	Politics	Focus Scan	Education Scale	Closure Flexibility Total	Socio-Economic Status
1	38	12	14	5	3	3	84	12
2	128	7	16	5	5	1	60	18
3	84	15	19	1	3	4	96	20
4	120	7	21	7	4	3	89	17
5	158	10	16	4	3	1	76	23
6	88	10	23	4	5	2	71	10
7	148	11	15	4	4	3	106	7
8	112	5	15	8	6	3	73	19
9	36	6	22	1	6	2	143	12
10	72	7	21	5	5	1	88	12
11	154	11	18	4	5	1	104	24
12	134	3	19	6	3	2	107	21
13	86	8	11	7	5	2	93	8
14	114	14	14	8	3	3	98	23
15	162	13	17	8	3	2	79	8
16	68	15	19	4	5	4	82	18
17	156	9	12	6	3	2	74	20
18	146	13	15	5	5	2	73	23
19	150	8	18	1	4	1	83	13
20	68	13	11	1	1	4	84	16
21	136	15	12	5	5	2	62	13
22	134	7	15	4	3	3	97	14
23	116	5	21	5	3	3	88	11
24	158	13	21	5	1	4	104	22
25	172	17	11	5	2	1	45	5
26	86	10	14	1	2	3	101	24
27	162	6	23	2	6	2	93	12
28	180	8	23	1	6	0	124	12

TABLE E-5 (Cont.)

Student Number	Total Bet	Test Anxiety	Defensive-ness	Politics	Focus Scan	Education Scale	Closure Flexibility Total	Socio-Economic Status
29	120	14	18	3	2	2	56	13
30	100	13	5	5	3	1	107	12
31	130	12	10	8	5	0	104	8
32	134	8	19	6	6	3	136	23
33	148	5	18	5	6	1	104	24
34	180	5	15	7	2	1	120	11
35	94	9	21	9	5	2	136	9
36	82	13	21	8	6	3	81	23
37	180	11	20	6	4	1	51	18
38	160	11	13	5	5	3	136	24
39	126	9	13	3	5	3	73	19
40	70	10	20	5	4	4	57	22
41	136	16	7	5	4	1	103	26
42	172	5	14	7	5	3	57	11
43	102	9	15	5	4	2	97	18
44	144	10	23	4	5	2	88	26
45	160	14	9	1	5	0	44	22
46	120	7	9	3	4	0	68	6
47	116	10	19	5	4	1	102	19
48	140	11	10	5	3	1	38	19
49	150	15	19	2	4	2	80	24
50	148	8	24	3	3	2	68	22
51	122	6	17	1	5	2	118	10
52	60	13	18	6	3	2	88	10
53	76	14	15	4	4	2	97	8
54	134	3	9	8	3	3	42	12
55	74	15	11	9	3	2	96	21
56	136	11	16	7	5	1	118	23
57	140	12	5	6	2	2	98	10
58	166	10	22	6	5	3	118	22
59	132	7	19	4	2	3	84	4
60	112	6	17	3	4	4	74	15
61	172	11	17	4	4	2	93	11

TABLE E-5 (Cont.)

Student Number	WAIS Block Design	Stroop								C.Q.T.			
					Difference			M.S.U.					
		I	II	III	a	b	c	English	Reading	Verbal	Information	Numerical	Total
1	41	39	50	90	11	51	40	15	23	27	36	15	78
2	33	25	42	75	17	50	33	27	34	50	49	42	141
3	43	43	50	80	7	37	30	28	21	26	40	30	96
4	29	32	51	120	19	88	69	23	25	43	42	18	103
5	39	29	44	72	15	43	28	32	33	64	60	35	159
6	28	26	50	71	24	45	21	25	30	56	36	16	108
7	43	36	49	86	13	50	37	28	28	52	50	47	149
8	28	31	51	79	20	48	28	29	34	57	42	34	133
9	39	39	60	134	21	95	74		29	52	50	19	121
10	41	39	46	64	7	25	18	28	38	70	52	42	168
11	33	27	47	73	20	46	26	22	25	62	46	24	132
12	36	39	46	109	7	70	63		37	67	55	19	141
13	33	25	44	64	19	39	20	30	34	61	51	27	139
14	40	29	53	92	24	63	39	23	25	45	35	28	108
15	44	34	51	121	17	87	70	26	28	63	50	38	151
16	45	34	49	70	15	36	21	13	20	38	44	16	98
17	38	33	58	99	25	66	41		7	42	44	21	111
18	38	48	58	117	10	69	59	27	30	49	45	26	120
19	44	32	53	99	21	67	46		37	64	46	29	139
20	43	29	52	95	23	66	43	24	27	64	49	16	139
21	34	29	55	85	26	56	30	23	29	59	42	19	120
22	42	36	46	85	10	49	39	28	31	54	63	47	164
23	28	31	52	87	21	56	35	36	42	67	53	25	145
24	24	25	50	88	25	63	38	29	33	46	55	32	133
25	24	30	46	82	16	52	36	26	34	54	54	34	142
26	32	43	61	88	18	45	27		29	46	52	32	130
27	46	28	38	57	10	29	19	31	37	54	55	41	150
28	35	30	52	82	22	52	30	32	32	58	41	22	121

TABLE E-5 (Cont.)

		Stroop									C.Q.T.		
	WAIS												
Student Number	Block Design	I	II	III	Difference a	Difference b	Difference c	M.S.U. English	M.S.U. Reading	Verbal	Information	Numerical	Total
29	40	34	52	102	18	68	50	24	16	44	35	41	120
30	33	30	44	82	14	52	38	21	22	49	51	20	120
31	38	36	45	81	9	45	36	24	40	57	39	18	114
32	43	35	47	91	12	56	44	26	28	55	50	24	129
33	43	33	58	94	25	61	36	33	42	67	61	46	174
34	45	27	45	67	18	40	22	31	32	48	48	44	140
35	30	31	52	84	21	53	32	35	32	41	48	44	133
36	45	31	54	72	23	41	18	29	42	71	52	43	168
37	35	30	42	90	12	60	48	24	32	52	49	29	130
38	47	46	51	78	5	32	27	24	33	52	49	45	146
39	36	28	50	86	22	58	36	29	29	47	45	24	116
40	39	43	58	100	15	57	42	15	20	31	27	19	77
41	45	35	44	68	9	33	24		37	66	47	26	139
42	42	26	46	79	20	53	33		37	52	48	27	127
43	46	33	50	88	17	55	38	16	30	47	50	41	138
44	40	30	42	80	12	50	38	25	22	42	42	17	101
45	44	32	52	86	20	54	34	21	36	62	60	20	142
46	34	33	38	68	5	35	30	24	30	39	45	30	114
47	45	29	46	80	17	51	34	21	32	59	39	27	125
48	29	33	50	74	17	41	24	25	27	43	46	31	120
49	22	25	43	78	18	53	35	21	18	34	39	25	98
50	28	29	45	83	16	54	38	23	7	42	48	28	118
51	44	27	40	64	13	37	24	34	38	66	58	39	163
52	32	46	56	151	10	99	99			55	43	20	118
53	43	34	60	82	26	48	22	28	23	38	40	29	103
54	29	29	48	93	19	64	45	26	41	63	54	25	142
55	48	35	53	91	18	56	38	32	27	60	57	24	141
56	44	34	47	98	13	64	51	29	36	44	47	40	131
57	38	25	31	51	6	26	20	36	33	54	53	25	132
58	41	34	50	89	16	55	39	22	27	56	49	27	132
59	39	38	63	92	25	54	29	28	35	61	42	40	143
60	42	26	41	77	15	51	36	31	32	51	47	31	129
61	44	35	50	95	15	60	45	21	31	63	50	23	150

TABLE E-5 (Cont.)

Student Number	Rorschach R%	F+%	Z%	Average Time 1st Response	W%	D%	Dd%	Reflection-Impulsivity Average Time	Total Errors
1	8	75	6	485	63	37	0	481	9
2	24	80	7	110	25	67	8	497	4
3	17	77	8	153	18	59	23	543	3
4	6	67	6	215	68	16	16	321	8
5	23	70	6	108	17	83	0	433	1
6	13	77	7	190	38	62	0	754	0
7	14	72	9	295	57	43	0	680	1
8	21	57	8	85	19	76	5	649	0
9	16	75	5	43	25	63	12	619	2
10	20	60	5	138	20	80	0	270	5
11	17	83	3	125	6	94	0	503	6
12	22	68	2	63	9	86	5	929	2
13	16	63	10	153	56	44	0	632	2
14	20	80	3	65	10	90	0	669	3
15	17	71	2	173	12	88	0	537	8
16	17	83	9	70	35	53	12	549	3
17	13	46	5	478	15	77	8	460	4
18	22	91	7	70	22	73	5	687	1
19	5	80	2	408	20	60	20	631	1
20	17	94	7	130	17	83	0	463	6
21	13	99	3	340	8	84	8	556	3
22	24	80	12	188	37	63	0	480	1
23	11	99	8	200	73	27	0	1138	3
24	11	54	2	270	9	73	18	758	4
25	14	72	4	200	14	86	0	570	1
26	21	67	10	140	43	57	0	726	1
27	22	68	2	115	9	77	14	669	3
28	23	70	10	78	44	52	4	768	0

TABLE E-5 (Cont.)

Student Number	Rorschach R%	F+%	Z%	Average Time 1st Response	W%	D%	Dd%	Reflection-Impulsivity Average Time	Total Errors
29	20	70	2	98	10	90	0	364	3
30	11	63	9	410	36	55	9	678	1
31	18	89	4	58	11	84	5	609	2
32	19	69	11	40	53	47	0	404	3
33	14	86	7	115	21	79	0	820	0
34	5	80	0	600	0	100	0	636	2
35	24	71	13	48	50	50	0	504	3
36	9	99	7	218	45	55	0	681	0
37	24	67	11	103	25	71	4	308	3
38	14	93	3	168	14	86	0	457	2
39	20	65	9	188	35	65	0	610	3
40	16	69	11	83	37	50	13	1321	2
41	10	60	4	170	30	70	0	550	1
42	15	67	6	175	67	26	7	858	1
43	17	77	4	50	88	12	0	196	16
44	18	83	7	128	17	83	0	340	4
45	12	67	5	98	42	58	0	817	0
46	23	61	4	100	17	52	31	261	13
47	6	99	6	165	17	83	0	746	4
48	24	67	1	113	4	84	12	909	3
49	12	92	4	368	8	75	17	806	2
50	17	53	1	270	6	94	0	680	2
51	21	62	13	80	52	38	10	653	1
52	14	86	7	225	43	50	7	200	8
53	13	38	9	178	61	39	0	868	1
54	20	55	13	73	45	50	5	430	2
55	15	93	8	115	33	67	0	624	1
56	14	57	3	195	14	79	7	593	0
57	14	79	8	165	29	57	14	670	0
58	22	59	5	218	5	86	9	694	2
59	14	93	7	240	43	57	0	821	0
60	7	71	5	125	71	29	0	617	5
61	12	83	7	225	25	67	8	719	0

TABLE E-6
SUPERVISING TEACHER'S SCORES

Student Number	Complexity	Lecture-Discussion	Beliefs	Word Assoc-iation	Closure-Flexibility Right	Closure-Flexibility Total	Politics	Education Scale	Social Class	
1	12	2	51	24	38	56	9	6	4	4
2	13	2	56	51	16	44	5	6	7	4
3	8	2	50	54	71	93	3	2	13	5
4	18	3	58	50	48	84	2	2	15	6
5										
6	6	0	54	69	80	136	7	2	4	3
7	14	4	49	50	76	116	4	3	8	3
8	16	2	44	46	38	148	7	3	10	6
9	14	3	68	48	55	71	2	1	16	5
10	12	3	75	62	118	164	8	3	24	5
11	10	3	53	71	50	76	4	2	7	5
12	7	2	24	44	56	84	3	2	10	6
13										
14	12	1	57	60	94	120	7	2	10	5
15										
16	3	3	50	33	92	120	6	4	15	6
17	14	3	45	53	26	84	1	2	14	6
18	18	1	61	55	76	98	7	3	13	4
19	12	4	57	67	55	77	3	3	8	4
20	15	4	54	46	71	101	1	2	21	5
21	10	4	49	32	58	116	5	5	13	5
22	23	7	81	71	40	124	7	0	14	5
23	17	4	63	36	60	92	8	2	13	5
24	10	4	63	70	52	82	2	2	16	5
25										
26	7	2	52	50	50	90	6	4	10	5
27				42	48	136				
28	18	5	65	45	74	104	5	1	11	3

TABLE E-6 (Cont.)

Student Number	Complexity	Lecture-Discussion	Beliefs	Word Association	Closure-Flexibility Right	Closure-Flexibility Total	Politics	Education Scale	Social Class	
29	15	3	55	78	59	101	7	3	18	6
30	16	4	74	50	61	75	4	3	9	4
31	23	4	65	62	92	100	2	1	17	3
32										
33										
34	5	3	43	63	50	108	4	2	14	6
35	12	3	38	56	88	118	7	5	24	3
36	16	1	64	71	118	136	5	0	10	6
37	23	5	62	56	65	136		2		6
38										
39	14	1	48	56	55	87	3	2	10	5
40	14	2	62	53	33	69	4	2	17	6
41	14	3	33	61	70	84	1	2	12	6
42	10	2	58	58	44	104	3	2	10	6
43	22	4	52	52	55	101	4	1	14	6
44	8	1	53	67	68	104	4	7	12	1
45	15	3	39	87	109	140	3	2	12	5
46	12	3	55	46	107	129	1	2	21	5
47	11	3	56	47	100	124	5	3	12	5
48	18	4	71	62	24	44	5	1	8	5
49	16	1	33	58	104	132	4	3	13	3
50	13	2	42	65	52	80	5	2	8	4
51	11	4	51	57	82	100	2	5	9	2
52										
53	6	2	47	52	60	94	0	4	12	6
54	10	5	69	61	67	89	6	3	17	2
55	9	2	51	56	84	98	1	5	8	5
56	7	2	42	50	74	100	1	4	14	4
57	8	1	37	48	20	168	4	4	13	4
58	4	2	33	49	24	64	4	5	17	3
59	12	3	57	69	176	196	7	2	8	5
60	14	3	55	53	68	92	6	2	12	4
61										